iXperium Teacher Designteam (TDT)
Virtual Reality
(English version)

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TABLIO-project http://tablio.eu
Tablets for classroom differentiation and inclusion
Erasmus+ Key Action 2: Cooperation for innovation

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INŠTITUT ZA NAPREDNO UPRAVLJANJE KOMUNIKACIJ

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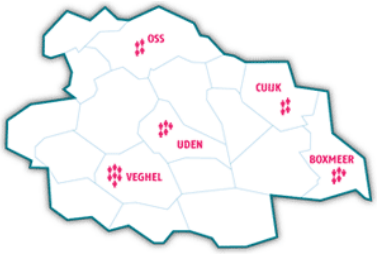
Participants:

Teachers: Paul van den Elzen (Leijgraaf), Jolijn van der Wielen (Leijgraaf), Els van de Looveren (Helicon), Danielle Blom (Helicon), Wilbert Ulijn (Leijgraaf)
Media coach: William Klaassen (Leijgraaf)
Researcher: Pierre Gorissen (iXperium/Centre of Expertise Teaching and Learning with ict)
Topic: Virtual Reality (VR)

1.2 About ROC De Leijgraaf

ROC De Leijgraaf is a school for vocational education in the Netherlands with campuses in Cuijk, Oss, Uden, Veghel and Boxmeer. De Leijgraaf has about 650 staff members and about 6,500 students in the domains Technology & Society, Economy & Business, Hospitality & Tourism and the Career Center.



1.3 About Helicon MBO

Helicon MBO is a school voor both vocational education and pre-vocational education in the Netherlands with campuses in Boxtel, Den Bosch, Eindhoven, Geldermalsen, Helmond, Nijmegen, Tilburg and Velp. Helicon has about 750 staff members and about 6,500 students in the domains Food, Environment, Agriculture and Horticulture, Green Living Environment, Flowers, Animals, Cities and People.

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Phase 1: Design challenge

The team of teachers had different backgrounds and existing knowledge with regards to VR. They started by discussing about a joint design challenge for the Teacher Design Team (TDT).
They agreed on the requirement that there is a need for more realistic forms of education. One way to do that is by visiting organizations/companies, but that is difficult to organize on a large scale. They expect that VR can help here by providing alternatives to the actual visits.

Hypothesis: The TDT sees VR as a way to provide students with safe environment to experience situations from their (future) working environment that would otherwise not have been possible.
The teachers also see VR as a required ict-skill for students, meaning that they think its important that students by graduation time at least have some hands-on experience using it. But students should also be able to form ideas and a vision with regards of the further development of VR.
A final shared question the teachers have it what it means to use / create a VR-tour[1] as a didactical activity.
Hypothesis: The TDT beliefs that it is possible to provide teachers and students with the needed support materials to enable them to use VR (with some support of the iXperium) within their lesosns and study.
Hypothesis: The TDT beliefs that the resulting learning materials can be used to provide teachers with means to provide differentiation and inclusion with mobile devices for their students.

[1] The teachers discussed what comprises a “VR-tour”. They agreed to distinguish between “VR-tour”, consisting of multiple linked 360-degrees images of videos and “VR- activity”, being a single image or video.

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Phase 2: collect information and analyse the challenge

Level up the same level

The members of the TDT had a different level of knowledge and experience with regards to VR and 360-degrees video/images. Some had already created VR based on 360-degrees video/images before, while other members were completely new to the topic. The members shared examples of previous products that they worked with or on and discussed them.

360-degrees video tour developed by Helicon it 2016-2017

The above picture shows a video tour in 360-degrees for a pig farmer in the Netherlands, developed by Helicon. The media coaches helped the members that were new to VR in trying out 360-degrees cameras and headsets.
In this phase the TDT also setup the Facebook page for the TDT showcasing a GDPR friendly picture of the whole group active in VR.

The members of the TDT studied current (mostly online) literature about VR.

A previous TDT had recommended to use smartphones and (relatively) cheap headsets as a means for students to experience the VR tours. The main reason for that choice was that the experience was “good enough” for its purpose while it added the bonus of lowering the barrier for students to watch the VR-tours using their own or abundantly available hardware from the iXperium.
The TDT also experimented, with support of the media coach, with tools and online environments that can be used to develop VR-tours. They shared experiences, questions, challenges and literature found and read via their own blog (in Dutch).
They created a questionnaire for teachers and students asking them about previous experience with VR. The results are available in Dutch.

Share early / Share often

Teachers are used to speaking in front of students, but are often reluctant to share results of ongoing developments with peers or other.
It can however help a TDT when they share results early in the process so that feedback can be taken into account during the next steps.

4D VR demo during the SURF Educational Days 2017

The TDT presented during the SURF Educational Days in november 2017, only 3 months after they started. The TDT explained their design challenge and provided the participants with a 4D VR demo (see picture) where besides vision and audio, smell and touch were used to enhance the experience.

TDT meeting De Leijgraaf December 2017

In December 2017 they presented the progress in front of other teams and teachers and managers from the VAT-school. In January 2018, they presented the progress and results of the TDT to colleagues at ROC Helicon in Eindhoven.

Workshop during the CvI conference 2018

The CvI conference in March 2018 was yet another workshop for external colleagues mainly from the VAT sector.
The workshops had always some hands-on activities which almost always had some kind of (technical) problems. Thus they also provided valuable input for the support materials.

Key take-away points from this phase.

- It was remarkable how quickly and easy the “new” members of the TDT were able to get up to speed about VR. Having colleagues around that can show first-hand examples and having a media coach that can help getting the hang of the technology greatly increases the speed with which teachers can learn to become comfortable with the technology.
- The questionnaire showed that not just the teachers in the TDT saw the applications for the technology.
- During this phase the members of the TDT were also introduced to the concept of sharing early and sharing often. While teachers usually are reluctant to share their experiences while only just started with the development, the TDT was (successfully) challenged to already share during the process. The sessions provided feedback leading to (small) changes in the formulated design challenge and ideas for a new VR-platform (teachvr) that the TDT could use (and decided to use).

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Phase 3: Design requirements

During this phase the TDT decided on the design requirements for the products they are developing. The requirements are based on a brainstorm with the team, advise from the literature, feedback from the presentations / sessions with students and teachers.
Design requirements:

- The deliverables of the TDT will be both instruction manuals, experiments with teachers and students, products developed during those experiments;
- The software and hardware used should be easy to use and accessible for teachers and students; having basic ict skills should be sufficient to use them;
- The deliverables will be using one of the three selected applications: teachvr, roundme, 3Dvista.
  This combination of applications was selected to offer choice based on the intended purpose of the tour and keeps the number of manuals, instructions and costs reasonable;
- The deliverables will be using the Ricoh Theta V camera as hardware to use;
- The products developed during the experiments should be usable/viewable anywhere (meaning outside of the school) and anytime by the students;
- Viewing of the products may require the installation of an app on the student's device;
- Products developed will either be VR-tours (consisting of a number of images/videos/actions linked to each other) or VR-actions (consisting of a single image/video/action);
- The instruction manuals aim to be self-explanatory for teachers and students. However, if needed support by the iXperium is available;
- All deliverables will be made available using a creative commons license.

Key take-away points of this phase

- Although the teachers were very clear on their requirements, they did not commit to any pedagogy related requirements.

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Phase 4: design, experiment and test

The TDT created three groups of experiments. A diary/logbook (in Dutch) has been kept of the activities within each of the experiments. The experiments are described below.

Manuals/Instructions

To support students and staff during the experiments, the TDT created a number of instructions (in Dutch) related to:

- The use of the available 360-degrees camera (Ricoh Theta S and Theta V)
- The use of TeachVR platform (https://teach-vr.com/)
- The use of 3DVista application (https://www.3dvista.com/)
- The use of the Roundme platform and apps (https://roundme.com/)

The instructions were tested during the experiments and where updated and improved based on the feedback that the TDT received while using them.

Experiment 1 Historical Walking Tour Oss

Wilbert and Paul worked, together with a group of students, on an external assignment for the city of Oss in the Netherlands (where De Leijgraaf is located). They build a historical walking tour where a VR tour with historic images is added to the real live walking tour. They created a VR tour where historic pictures are overlaid over the current situation.
They started with one teacher and a group of 18 students (3rd year architecture students), they worked in groups of three students.
Goal of the learning activity was to have the students take control of the production. The TDT developed the needed manuals and three face to face moments of half a day each: 1) create a storyboard 2) create the 360-degrees images, 3) how to create the tour in 3DVista.
Challenges for the students:

- The students needed more time than was available to get all the needed background information about the city and the pictures provided. This resulted in too little time for the actual process of storyboarding, designing;
- Travel time was an issue for some of the students;
- The students and their teacher did not feel genuine owners of the assignment;
- Because the assignment was done for an external party, failure was not really an option. This is a dilemma for assignments that are part of the educational process;
- The experiment showed that, although 3DVista was easy enough to use, getting the placement of the pictures just right (needed for the desired visual effect) was difficult.

The TDT presented the result, demonstrated the Tour and collected feedback for a second version of the tour.

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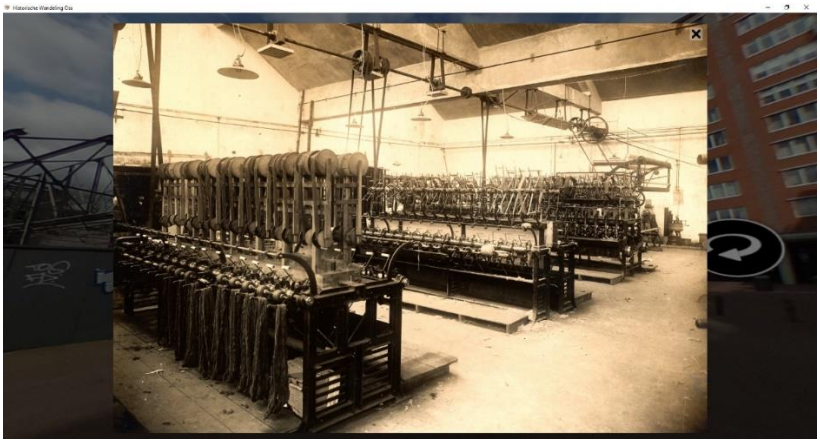
Screenshots of the result:



Although there were problems, positive result was that most of the group of 18 students took the assignment very serious and spent genuine time on it. The students were enthusiastic about the principle and plan on using it for their own portfolio. The teacher also was very positive about the assignment and the technology used.

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Experiment 2 Training organizations within the social care vocational training are being portrayed in 360 degrees

Jolijn worked on an assignment as part of the social car vocational training: a 360-degrees tour of a number of social care organizations. With the experiment both TeachVR and 3DVista were used. TeachVR was used to create an example tour for students, usable for the information day for potential students.
An example of a tour created using pictures and video can be viewed online:
http://vr.ixposs.nl/web/Hoeve/
The tour contains some text in Dutch but uses icons for the navigation.

One of the social care organizations decided to not allow the use of the created pictures/videos after initially allowing them to be created. It shows that, although they were explained what the goal was, organizations aren't always able to assess what the result is going to be and may not always be comfortable sharing the result.
The assignment itself can also be used for other domains, it is being shared (in Dutch) as part of the results of the TDT.
The students used the instruction manuals developed by the TDT. They had some technical problems with regards to the size of longer videos on the Theta S.
Some students did the project as part of a mandatory assignment while others choose it as a voluntary subject. The second group was more enthusiastic than the first group.
The instructions created by the TDT were easy enough for the students to work with. Some less technical students and some of the teachers needed some additional support to be able to do the assignments.

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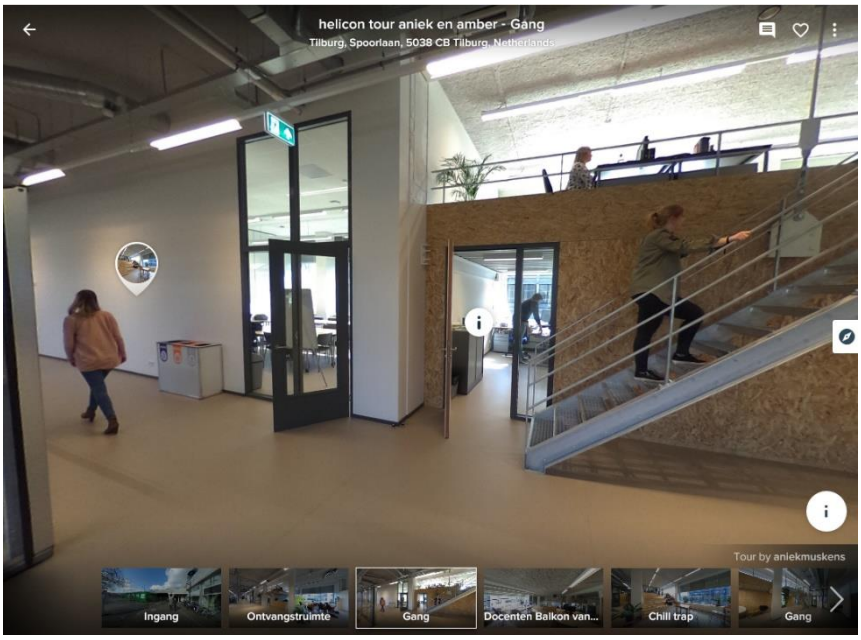
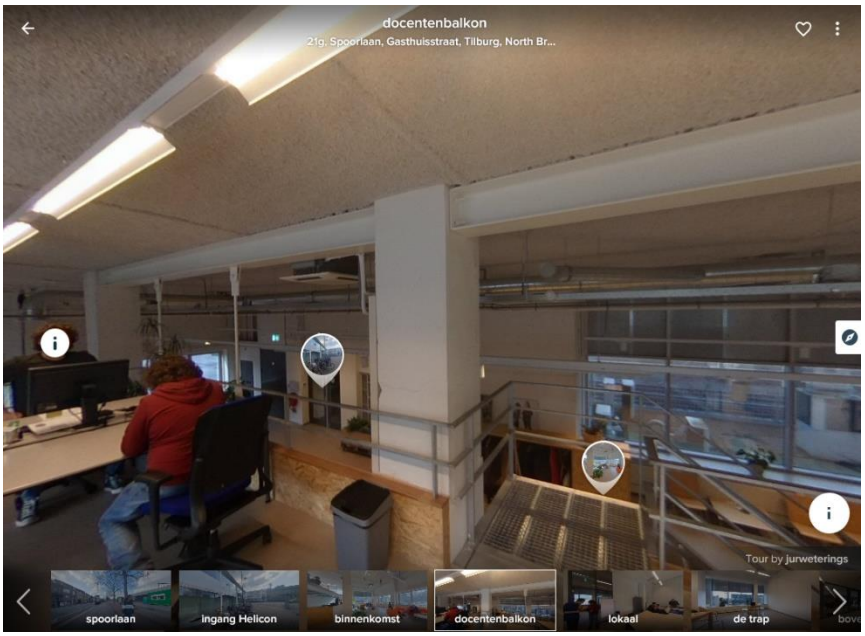
Experiment 3 Helicon-tour, virtual tour through Helicon in Eindhoven and Tilburg.

Els and Danielle did three experiments within Helicon: one experiment involving level 2 and 3 students in Eindhoven, one experiment involved level 2 students in Tilburg. The third experiment involved doing a training for teachers.

During the experiments students worked with Roundme. They built a virtual Tour of the Helicon buildings in Tilburg and Eindhoven. Like with the previous experiment, the virtual tour was aimed at potential students for use during the information days of Helicon.

The pictures below show screenshots of the completed products.





See: https://roundme.com/tour/254385/view/752695 for an online example. There is some text in Dutch in the tour, but navigation uses icons.

Students could participate voluntarily in the experiments. In Eindhoven and Tilburg a total of 5 students created products. Students and teachers (that participated in the training) were positive about the learning activity.
The activities have been observed and recorded. A video of the evaluation by the students (in Dutch) has been created and a video with an impression of the training for the teachers was created (for internal use).

Observatie pilot Tour Helicon Eindhoven

Maandag 26 februari 2018; sessie 1 (mindmap) 12.00 – 13.00 uur
- Leerlingen erg enthousiast
- Leerlingen willen meteen aan de slag met het maken van foto's
- Zijn teleurgesteld als ze eerst aan de slag moeten gaan met de mind map
- Gaan serieus aan de slag met de mindmap, denken er goed over na
- Na afloop geven de leerlingen aan dat het zinvol is om met de mindmap aan de slag te gaan

Maandag 5 maart 2018; sessie 2 (beeldmateriaal verzamelen) 12.00 – 13.30 uur
- Leerlingen heel erg enthousiast
- Zijn zelfstandig aan de slag gegaan
- Leerlingen maken veel foto's. Na afloop hebben ze deze bekeken en de beste foto's geselecteerd
- Moeite met connecten van camera met telefoon (oude Samsung versie)
- Foto's van camera afhalen was teveel moeite. Energie was op

The results of the products created by the 8 teachers during the training, are available online (scan the QR-code):

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VR links:

Marianne/ Bert

Mayke/ GertJan

Theo

Tatjana

Diana

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Phase 5: Evaluate and share

The TDT designed and tested a number of lesson designs using 360-degrees pictures and video. They created instructions for the tools needed by students and teachers. The goal was to make the instructions so clear that students and teachers could even use them unassisted.
Where possible they shared their products online, for pictures and videos involving students this was a challenge.
The TDT presented in public about their preliminary results both during an external conference (the CvI conference for VAT school in Leeuwarden) en during internal knowledge sharing meetings. It is not very common for teachers to present about work in progress. But for the process of working in a TDT it is considered very important.
The TDT maintained a public Facebook page where they shared progress, pictures and news.

After completion of the work of the TDT, the results are being integrated in the regular trainings provided by the academies of both the Leijgraaf and Helicon.

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"Evaluation Differentiation and Inclusion using mobile devices (iXperium / TABLIO)"

Date: 10-10-2018 (edited and translated on 07-03-20109)
Researcher: Pierre Gorissen, iXperium / Centre of Expertise Teaching and Learning, HAN, Netherlands
Activity / Learning Arrangement: Designing a Virtual Reality (VR) tour.
Short description of the activity / learning arrangement:

Students create a "tour" comprised of pictures taken with a 360-degress camera and are linked via hotspots (visual links). The participant watches the tour using VR glasses, existing of a smartphone in a case. They can look around by moving their head and navigate using the hotspots by focusing on it for a while.
The learning arrangements have been used in different contexts, for example by students to create a self-image presentation in VR, to create a tour through their own school, to design historical walking tours through their home city of to create a tour in a future workplace.
All material is developed in Dutch, the manuals have been made available online (in Dutch) via:
http://ixperium.nl/designteam-virtual-reality-ixperium-leijgraaf-2017-2018/.

This evaluation tool has been developed by the iXperium / Centre of Expertise Teaching and Learning in the Netherlands. It can be used to look back on a developed learning activity and to describe the ways it incorporates ways for differentiation and inclusion. It can also be used while developing a learning activity to make informed choices during the design.
For the TABLIO project, this evaluation has been extended using the TABLIO reference model.

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Dimension: standardisation versus differentiation

Questions	Score				Explanation	Role of ICT
	no	minor		major		
Is there differentiation in **what** is being learned? Are the learning goals for all students the same or is there differentiation in goals?	0	1	X	3	In most use-cases the learning goals for all students are the same. There is product differentiation though and often the use of VR in itself is not mandatory but used as a way for process differentiation.	The use of VR / 360-degrees images offers students additional ways to express themselves compared to other available media.
Is there differentiation in **level** of the student? Is the level of the learning material for all students the same or are differences in readiness being taken into account?	0	1	X	3	The differentiation is implemented by the amount of support that students get from the teacher. It is not incorporated into the learning material.	Currently, the learning material does not use ict to the extend that would be possible, for example if the (online/digital) support was more flexible and need-based.
Is there differentation with regards to **where and when** is being learned? Is this for all students the same or are differences between students taken into account?	0	1	2	X	Students can use the learning materials and finish the assignments in their own time and largely outside of the school.	The choice for cheap 360-camera's and smartphones instead of expensive specialized equipment has made it easier for the school to provide enough devices to finish assignments on their own time and outside of the school. Most students own smartphones capable of controlling the camera's and viewing the resulting materials.
Is there differentiation in **how** is being learned? Is the way the students access the learning material the same or have differences between students been taken into account?	0	X	2	3	The learning materials are only available in text/PDF. When needed the teacher differentiates in the amount of support and help that is being provided.	

Questions	Score				Explanation	Role of ICT
	no	minor		major		
Is there differentiation in **tempo/time available** for learning? Is the available learning time the same for all students or are differences between students taken into account?	0	X	2	3	There is differentiation because students are not limited to the time available during the scheduled class. However, the time available for the production of the resulting products is restricted.	The choice for cheap 360-camera's and smartphones instead of expensive specialized equipment has made it easier for the school to provide enough devices to finish assignments on their own time and outside of the school. Most students own smartphones capable of controlling the camera's and viewing the resulting materials.
Is there differentiation in **instruction**? Do all students get the same instructions or are differences between students taken into accounts?	0	X	2	3	The learning material is only available at one level, the teacher implements differentiation in the amount of instruction a student receives.	
Is there differentiation in the way the learning material is **processed** by the students? Is the way the students work with the learning materials the same or are differences between students taken into account?	0	1	X	3	The assignments are open and diverse enough to take into account differences in readiness of the students.	
Is there differentiation in **evaluation / feedback** received by the students? Is their learning evaluated in the same way?	X	1	2	3	All students got personal feedback on their assignments. There was no differentiation here.	ICT could have helped to get feedback form others than the teacher, for example by having peers comment on the tours, add likes, feedback etc.
Is there differentiation taking into account the **personal interests** of the students? Can students provide their own learning goals/questions?	0	1	X	3	In a number of cases, the VR assignment in itself was a non-mandatory way of fulfilling the assignment. So the students chose the assignment out of personal interest.	

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Dimension: Amount of self-direction by the student

To what extent is the learning externally directed, for example by a teacher or an ict-tool (=0) or is the student in control (=3)?

Questions	Score				Explanation	Rol of ICT
	No	Low		High		
Can students decide **what** they learn?	0	1	X	3	The assignment were group based, students could assign tasks and thus their learning based on preferences.	
Can students decide **when** they learn?	0	1	2	X	The students were not restricted to the class times.	The choice of ict made it easy for student to also work outside of the class.
Can students determine **with whom** they learn?	0	1	2	X	The students could form their own groups	
Can students determine **where** they learn?	0	1	2	X	The students were not restricted to the class times or the school building.	
Can students determine **in wat** tempo they learn?	0	X	2	3	All students had to adhere to the same overall time path.	

General impression of the activity based on the measurements:

The documents supporting the learning activity help teachers to differentiate using VR. The documents however still focus a lot on the technical / learning technological aspects of VR. Differentiation is achieved more by the way the learning arrangements are being used and is not so much integrated into the design.
And although the ict enables the students to be flexible in where they work on the assignments, it is not put to use as a means to extend the differentiation options of the learning arrangements.
Teacher manuals are limited to the actual use of the ict and the assignments, but lack in the area of differentiation, concrete learning goals, coaching instructions (and tips).
Students have a lot of freedom within the assignments.

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TABLIO REFERENCE MODEL

If we plot the results of the teacher design team on the TABLIO reference model/ concept map (see below), we get the following results.
Aim for the differentiation is to increase the motivation of the students by allowing them to use modern technology allowing them to express themselves in a way previously not possible.
The development took part both on micro-level (teacher level), but also on meso-level. During the development process, the ict supporters were involved in the design and were effectively trained in supporting new teachers that want to use the results of the TDT after it has finished. Rules on school level influenced the design because it excluded the creation of actual tests/exams using VR.
Differentiation using VR is feasible, but in the current designs is not yet implemented in a pro-active and goal-oriented way.
The use of VR based on the learning materials is possible as an extra-curricular program, but was used as part of the regular program. Heterogeneous groups of

students were formed so they could learn from each other and divide tasks.
The learning activities aimed at reaching students based on their interests and learning profile. It offered process and product differentiation.

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