beaconing
BREAKING EDUCATIONAL BARRIERS WITH CONTEXTUALISED PERVASIVE AND GAMEFUL LEARNING

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Statement of originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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EXECUTIVE SUMMARY

The main objective of D3.1 is to capture and analyse the different needs and requirements from the stakeholder groups. Beaconing is aimed at delivering a solution that will support a new and pervasive way of learning and therefore several stakeholder groups like teachers, students, school administrations, authorities, as well as parents are involved. In addition, in order to ensure the sustainability of the Beaconing ecosystem someone needs to be interested in maintaining the solution and providing services to potential users. Additionally, companies also offering educational services or games have been included among the stakeholders. All stakeholders are represented in the consortium, but we have also collected requirements and needs from externals in order to ensure a boarder audience. Furthermore, due to the nature of education in Europe, curricula, teacher education as well as schooling equipment underlay national differences, which we need to take into account for later uptake in other schools than our pilots.

This deliverable is the first of two on user requirements and gives a first indication of what the users imagine they need. However, we expect that the pervasive and personalised learning environment will nurture new needs as soon as the first mock-ups are available for test. Consequently, this deliverable will be updated later.

The results presented in this deliverable are based on the contribution of ca 800 different participants. The results were collected until end of June. Currently we are collecting new results and an update as annex will be presented in November.

The results show a large variety among the need for adaptability for users (teachers, students) with special needs. The external group has identified sight and hearing impairment and dyslexia as the most relevant, whereas the internal see less need for their pupils. A second interesting result is the willingness to share developed material with others and the expectation that the Beaconing platform will offer the opportunity to adapt learning material provided via the platform.

The document starts with a short introduction to the objectives and the scope, before the most relevant results from internal and external answers for each user group are presented, compared and discussed. The deliverable concludes with the main findings and the keys for the following development tasks. The full results of all questions can be accessed online. The reason for this is that we regularly update these and it is important for the developers that they have access to the latest results.

1   INTRODUCTION

Beaconing is aimed at providing a pervasive learning environment that will support the teachers in providing personalised learning units and support the students to learn as they learn best. The Beaconing platform will support both users with and without special needs. The basis for the development is the user needs and requirements which are outlined in this document.

1.1   ROLE OF THIS DELIVERABLE IN THE PROJECT

This deliverable is the first of two on user requirements and provides input to WP 4 as well as task 3. 4 and 3.5.

1.2   APPROACH

We have used a participatory approach for collecting the user requirements (See chapter 2). The requirement elicitation in Beaconing will be carried out in two main steps: one now at the beginning of the project and one later when mock-ups and small demos are available for demonstration of the capacity. Within these two main periods, more and more pilot members will be recruited and therefore we will continuously update the user requirements. The reason for having two main rounds of requirements elicitation is that Beaconing will make available a new way of providing teaching and of supporting learning, which is not existing. The concrete understanding of possibilities and corresponding possibilities can be very hard to define for a user at such an early stage. Therefore, in order to provide a final product that will be tested in large scale, the users will have the opportunity to increase the details of their specification or also to change some requirements after a first test period. In the first round, questionnaires are used, in the second round will use more experimental methods for requirements engineering [1, 2]

1.3   STRUCTURE OF THE DOCUMENT

This document is divided into three chapters. Chapter one provides an overview of the objectives and the research methodology applied in the deliverable and serves as a basis for understanding the analysis of the different requirements from the different stakeholder groups (students, teachers, parents, schools, authority and businesses). The analysis is divided into internal and external answers. Internal answers are delivered by members involved in a pilot, whereas the external answers come from respondents not participating in the pilots. These are collected either online or by other project members. Each of the subsections comprises a comparison of the two groups. This is important information, since we are aiming at being able to deliver solutions that can be attractive to external schools and students. The last chapter comprises the deduction of the overall requirements. In addition to the main chapters, there is also an annex containing all answers given by the respondents. Even though they might seem less important in the current state, they are required for the comparison in the second round of the requirements that will be carried out after we have established the first prototype and small scale testing.

2 RESEARCH METHODOLOGY

This deliverable is based on a typical approach for requirements elicitation for product service systems, for which Beaconing can be considered. Beaconing will be an innovative new learning environment being flexible to the different needs both at personal and organizational level. Therefore, establishing requirements that are sufficiently resilient for future, currently unrevealed potential and needs is of utmost importance (also future products or services that can be generated). This is quite a complicated assignment where many prerequisites have to be taken into account. The requirements of the users (teachers, students and parents) and other stakeholders will guide the developments in the project in two iterative phases and will be tested in small and large scale pilots.
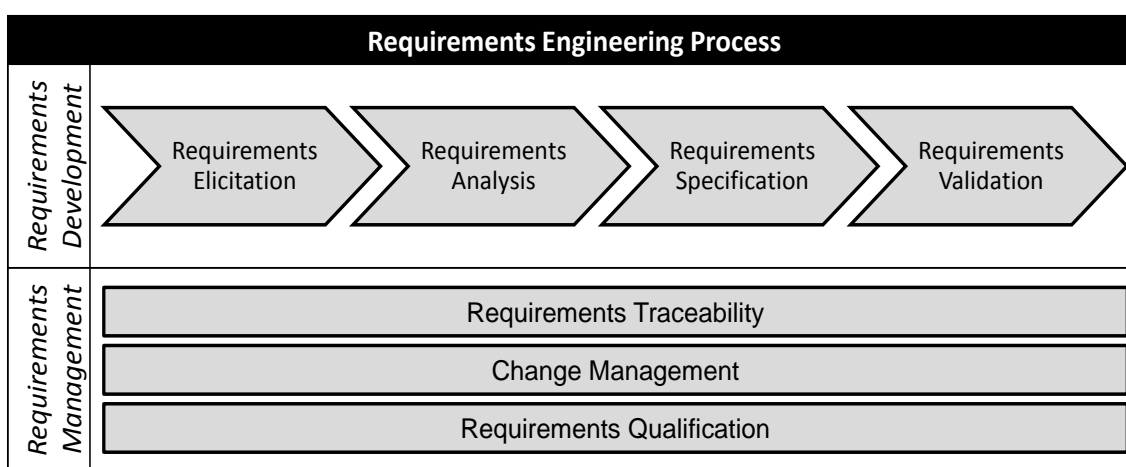
Figure 1: Requirements engineering process (Source: BIBA)

Table 1 shows the approach we have selected. It will be repeated after the first set of small scale pilots. It comprises three main steps that are described in the table below.

Main steps	Techniques
1. Elicitation	**a) Internal workshop** using brainstorming methods among all project partners in order to define the main topics for the questionnaires as well as to cover all perspectives (Barcelona, March 2016) **b) Questionnaire – (D3.1)** **c) Scenario building of lessons plans (D3.3)**
2. Analysis	**a) Unstructured requirements** **b) Document analysis**
3. Specification	**a) Analysis of the model** **b) Classification** **c) Discussion of the results within the consortium**

Table 1: Requirements development process

The techniques used enabled us to go from a wide and generic perspective to a focused one that can be manageable. The objective of the Specification step is to unify and integrate the extracted information. They will be unified for the stakeholder perspective.

In the elicitation phase multiple techniques were used, as one technique per se is not adequate to cover the entire range of needs. The process modeling uses a language enabling high level of comprehension and in parallel a high level of standardization.

The approach starts with the description of the AS-IS situation and context, which includes the end-user and other stakeholders, as well as their technical environment. The current usage of different learning

technologies was collected and analyzed leading to the derivation of the first set of requirements. The results are subject to a refinement in the second phase.

An important part of the elicitation is related to stakeholder identification: Their roles, processes and other characteristics, as well as their involvement with the expected solutions have to be studied. The methodology for Requirements Engineering will therefore consider a number of distinctive points to generate meaningful requirements leading to a successful solution:

- **Identification of stakeholders, technologies, ICT and learning systems in place**
  Relevant stakeholders, technologies and other systems have to be described to be considered and integrated in the Beaconing developments.

- **Questionnaires**
  In order to get an indication of the needs and requirements of stakeholders regarding needs, current usage and knowledge, questionnaires for the different groups were developed (Malhotra and Grover, 1998, Forza, 2002). The questionnaires were developed by the consortium as a whole, in order to ensure that all perspectives (pedagogical, technical, psyh., business) were covered. A questionnaire was designed for each stakeholder group. They were distributed to both the pilots as well as online. The questionnaire was tested before use on a small group of researchers.
  The number of questions varies for each questionnaire. There were a mix of open questions (most questions were open for students) and multiple choice. Open questions were used in each section, in order to get enough detail from each of the participants. The usage of unstructured questionnaires makes it more difficult to analyze and to find similarities, but this is necessary since our target groups are very inhomogeneous and we also wanted to capture current usage. The level of detail is specifically important due to the differences in topics and experience for different pilots as well as to cover cultural and regional differences. The reason for the selection of multiple choice questions was the need to obtain quantitative answers and to know what they currently use. The advantage of multiple choice questions is that it is quick and easy to complete and analyze and the answers can be converted into data. The disadvantage is that the answers are not explained, not all questions can be answered with yes/no, or the Likert scale. All questionnaires were developed in a co-creative process amongst WP 3, 4 and 5. This led to a time consuming process. The questionnaires were distributed to the pilots in May for translation. We also have a set of questionnaires online for externals, for all groups including students, but only if they are older than 18 years. Consent and informed consent was collected from the relevant stakeholder groups (younger people). Even though we have several pilots in Beaconing, they still just represent a very small portion of students and teachers in Europe. In order to cover regional and cultural issues, we have collected requirements from internal (in the pilot class) and externals (other schools in same area, other regions and countries. The results are presented according to this definition as internal and external and compared.

- **Documentation of requirements**
  User requirements extracted from the user feedback have to be understood and discussed among all parties that are involved in the Beaconing project, therefore the preliminary results were discussed at a general assembly meeting, and will be continuously discussed as more results are collected and analyzed.

Many requirement elicitation approaches depend on a physical meeting of the stakeholders. An organisation of a meeting inside the project takes some time and is not possible with large scale pilots. Therefore, questionnaires were applied in the first step of the approach. The questionnaires were prepared and sent to the pilots, as well as online for externals. As foundation for the identification of requirements, the business processes in their scenarios, including the stakeholders involved had to be described. Additionally, a technical questionnaire was distributed among the end users to gather

information about their IT environment and needs, to establish what existing tools and reusable components partners already have (D3.2 inventory).

The users were remotely guided through the questionnaire by the responsible partners in the pilot work packages. In addition to the completion of the questionnaires, a requirements workshop was organised in Barcelona and the intermediate results were discussed in Porto in June 2016.

3   ANALYSIS OF QUESTIONNAIRES

This chapter analyses the data collected via the questionnaires. These are completed online, as well as in paper form. The number of respondents varies for each stakeholder group. This analysis will be updated as soon as we have all pilot candidates, therefore, this can be considered as a living document.

3.1   ANALYSIS OF THE PARENTS QUESTIONNAIRES

3.1.1   Purpose and structure

Beaconing is targeting students between the ages of 16 to 24. This is an age in which many students are working independently on their school work with little need of support from parents. However, parents of those with special needs as well as those at risk often invest much time in the support of their children and in most cases all parents are concerned and interested in the schooling of their children and play an important factor in both the motivation as well as in the acceptance of new solutions. Furthermore, most children in this age are economically dependent on their parents. Therefore, even if it at the first sight, this group seems not so relevant, they are important for the uptake and the acceptance of the Beaconing platform. Therefore, these questionnaires aim at understanding the parents' view regarding the study structure, their satisfaction regarding the child's studies and how involved their children are.

The questionnaire comprised of 17 different questions, on how much they help their children, what sort of feedback and support they would like, as well as their acceptance of IT and experiential learning. All questions are listed in annex A.

The following two subchapters show the results of the questionnaires. Afterwards, the results were distinguished between internal and external outcomes in the Comparison chapter and finalised in the summary.

3.1.2   Internal outcome

The following figures show some of the important results of the questionnaires. So far, 20 internal parents have answered. This is quite a low number, but again it is important to remember the age group of students - often they do not want to involve their parents. Nevertheless, the results of the 20 show quite well how important it will be for our take up to inform parents about the possibility new teaching solutions provides for supporting their children's learning process.

Figure 2, shows the reluctance of the parents to game based learning. Only 40% have the opinion that educational games can be helpful or very helpful, whereas 30% think they will not be helpful. Most importantly, however is that 30% do not know. These will need to be informed about educational games and possibilities, so that they can make up their mind.

How helpful do you think the educational games could be to your children?

5 **6** **3** **6**

not helpful ▪ I do not know ▪ helpful ▪ very helpful
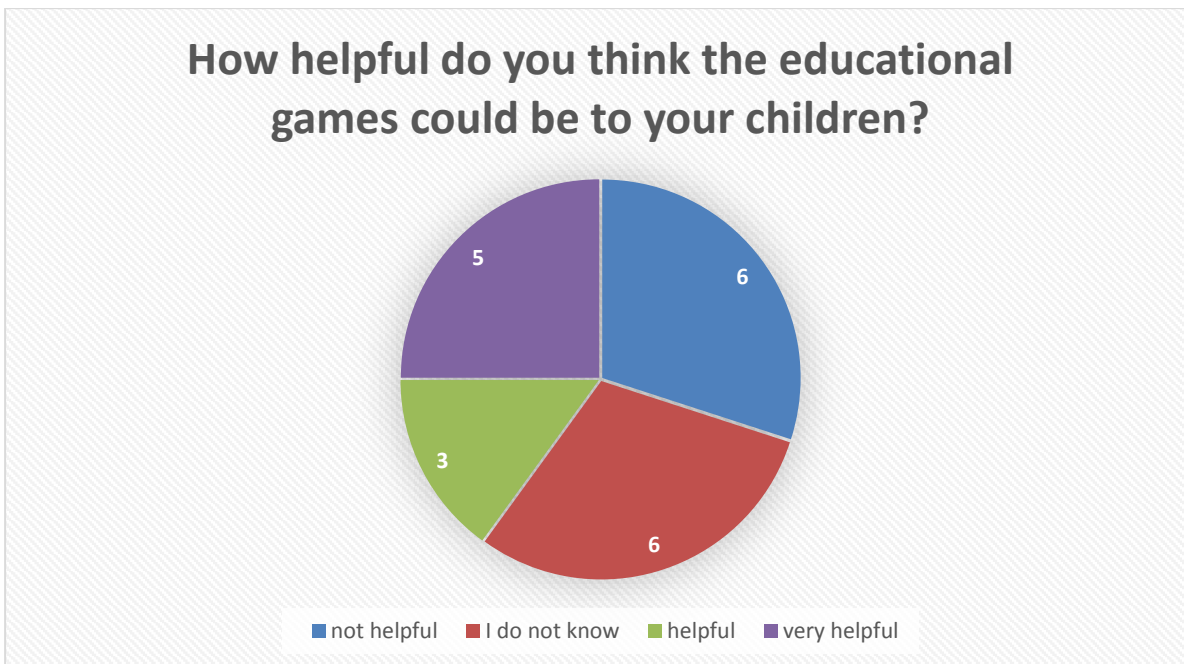
Figure 2: How helpful do you think the educational games could be to your children?

Even though we are targeting 16-24 aged students, 65% of the parents check the progress at least once a week, as seen in Figure 2. While another 10% say they only check their children's educational progress once a month. Only a quarter of the respondents stated that they do not check. The high percentage also shows how important it is to involve and inform parents about the solutions capacity to give personalised feedback to learning and learning progress.

How often do you check the progress of your children's education?

5 **7** **2** **6**

daily ▪ once a week ▪ once a month ▪ do not involve
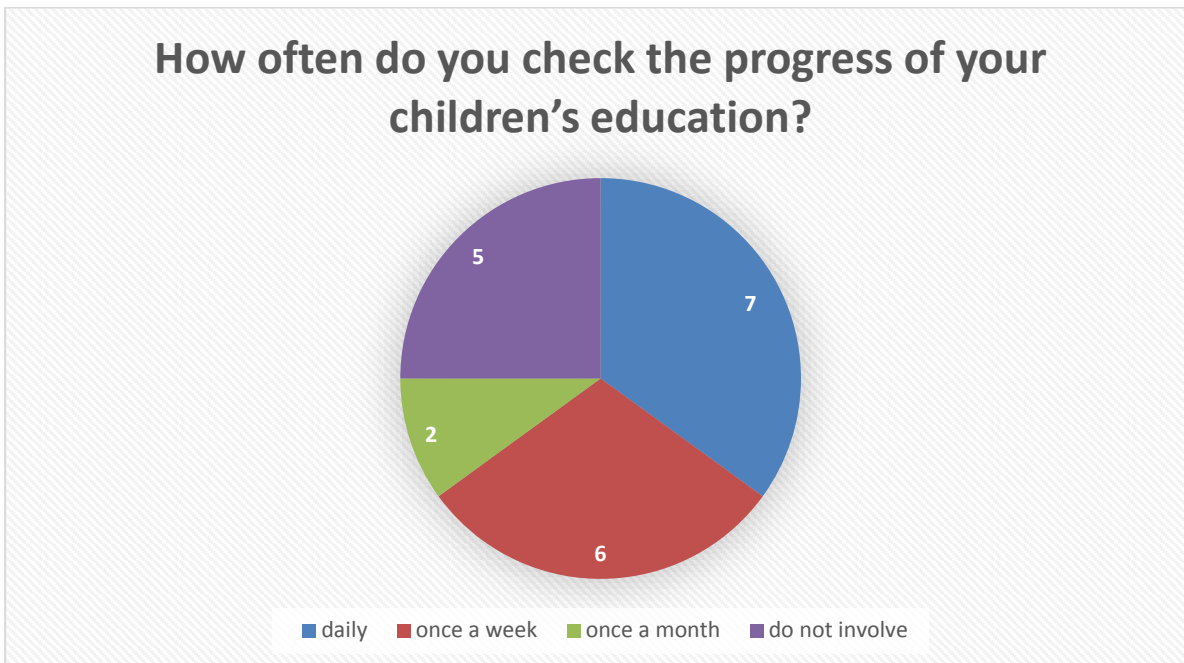
Figure 3: How often do you check the progress of your children's education?

In line with the great engagement and monitoring of the students in Figure 3, Figure 4 shows that most parents are interested in understanding and knowing, which challenges and struggles their child is facing during its learning process.
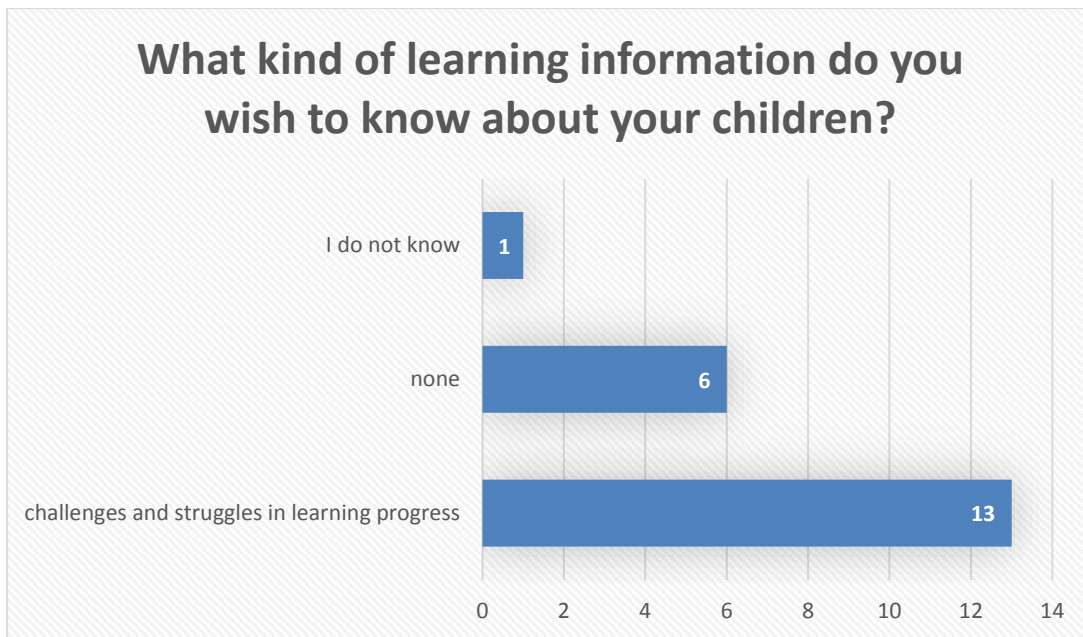
Figure 4: What kind of learning information do you wish to know about your children? (Score, localisation …)?

The next section of the questionnaire addressed the parents' opinion on location based games. Whereas 75% would not engage themselves in location based gaming with their children, 65% would allow/support their children in playing these type of games. This indicates a high acceptance for educational games as a learning tool, and is somehow contradictory to the results in Figure 2. However, only 20% would be willing to also pay for the usage of such games, which is more in line with the results in Figure 2.

Beaconing aims to support both disabled and non-disabled students and teachers, but will not cover all disabilities. Therefore, it is important to know where to put the priority. Figure 5 indicates that over 55% would expect support for students with dyslexia, while a third answered that Beaconing should support students with autism. 10% of the participants in the questionnaire had no idea which disabilities Beaconing should provide support for.
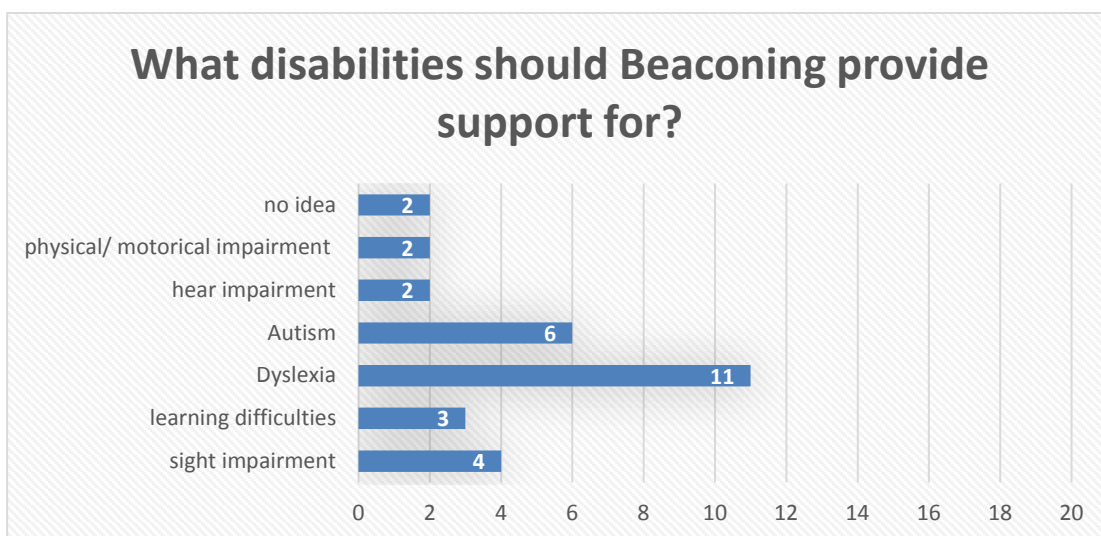
Figure 5: What disabilities should Beaconing provide support for?

Personalised education might give deep insights in a person's capabilities, therefore security issues or lack of trust on the security might make them not use the system. Figure 6 shows that 45% do not see

any risks, whereas a third of the parents are afraid of the misuse of their children's private data and another quarter of the parents have doubts about the data usage and privacy.
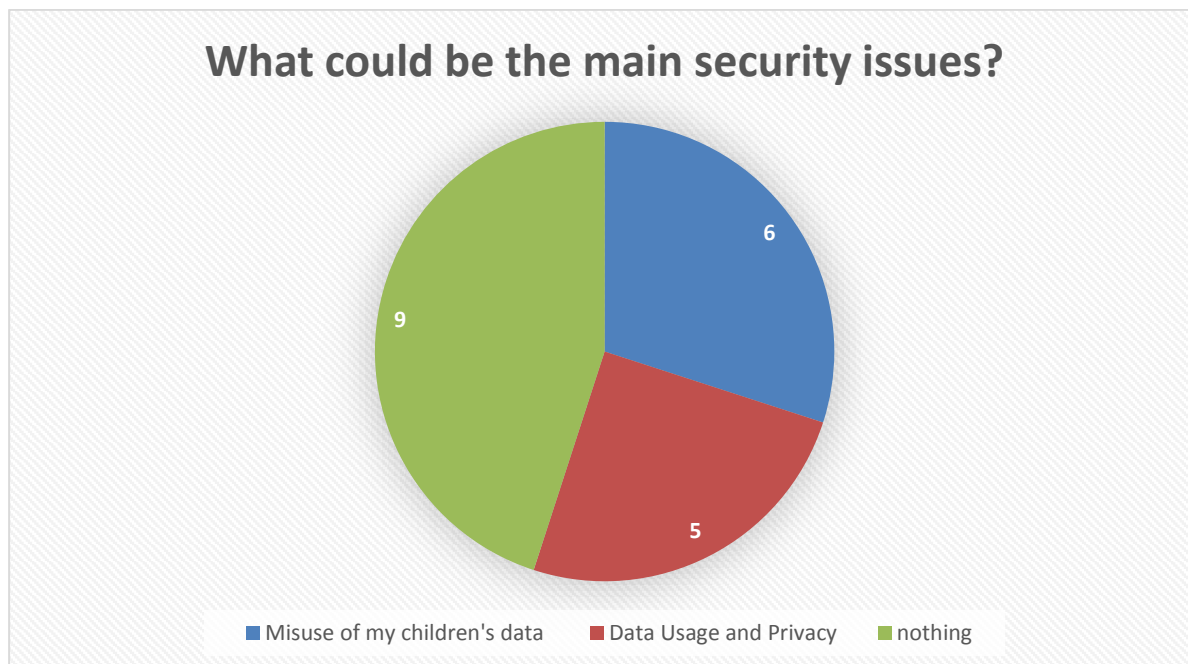
Figure 6: What could be the main security issues?

The last part of the questionnaire was related to what sort of feedback they would expect. Most parents wanted tutorials and guidelines, as well as hard copy material. This is a challenge, since hard copies are costly and difficult to automatically personalise, specifically if the material needs to be processed afterwards to enable feedback to the students. An interesting outcome is that hardly any of the parents wanted digitised lessons - one of our main outcomes. This is again in line with the previous results on educational games, but can also indicate that many cannot really see the advantage of the technology. We expect that this opinion will change when they have seen the concrete possibility of customisation.

The next section will look at the same questions for external parents.

3.1.3   External outcome

The intention behind asking external parents is to make sure that the outcome is transferable and will suit a larger number of students than those participating in the small scale pilot at this early stage. Answers were collected via online forms as well as in paper questionnaires. So far, 156 parents have answered. However, some did not answer all questions, so there is a variation between 126 and 156 per question. The questionnaires are the same as for the internal participates.

Regarding the usefulness of educational games, 54% find they are very helpful, whereas 43% consider them as helpful (Figure 7). Only 3% either did not know or did not think, that educational games would be helpful for their children. This result diverged greatly from the internal parents' view and we are currently analysing additional data to understand why.

How helpful do you think the educational games could be to your children?
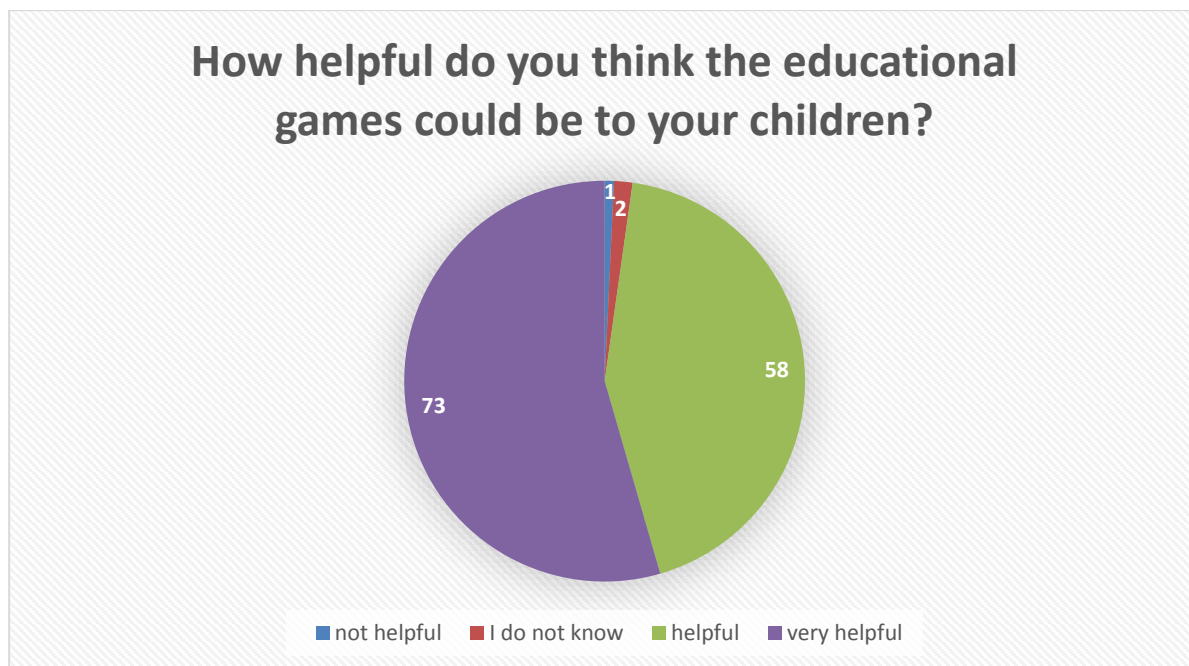
Figure 7: How helpful do you think the educational games could be to your children?

Regarding how often the parents check the progress, Figure 8 shows that about a quarter of the parents monitor the progress every day, whereas almost half of the respondents monitor weekly. Only 5% are not involved. Again, the results differ from the internal respondents, but the number of participants is also much higher, so this might be more representative for the overall parents' situation.

How often do you check the progress of your children's education?
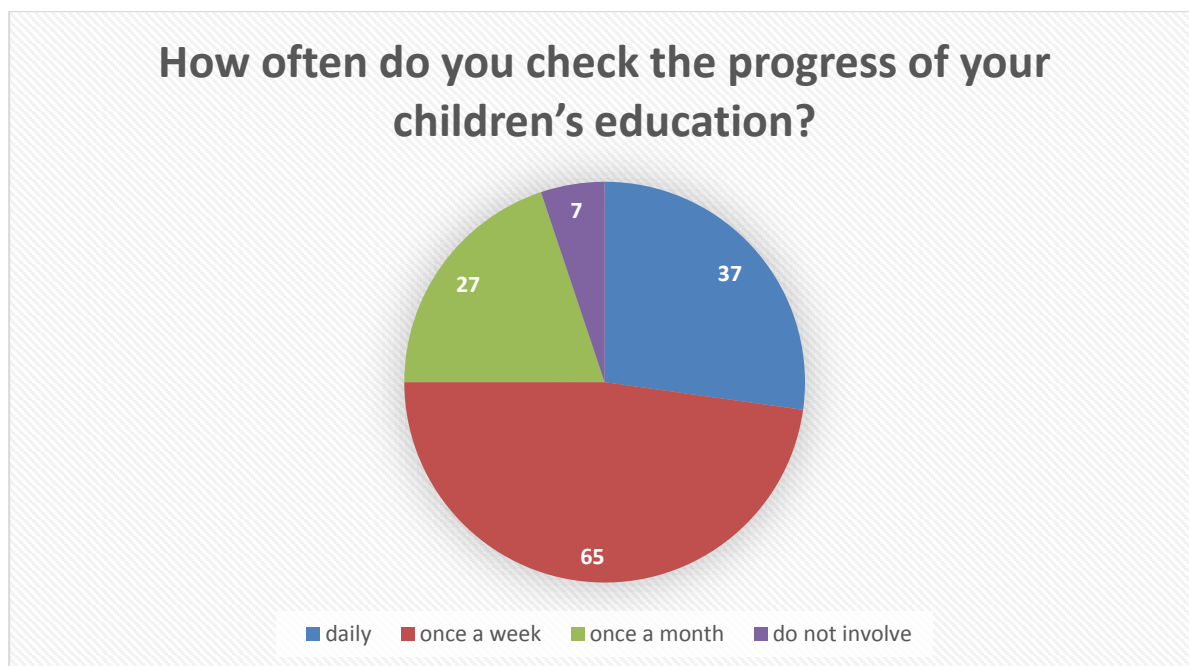
Figure 8: How often do you check the progress of your children's education?

An important issue for Beaconing is related to analytics and feedback to the user of the Beaconing platform. Figure 9 shows that 54% of the participating parents are interested in grades and scores, whereas 22% are interested in the challenges their children are facing. 12.5% of the parents' answered that they want to know how good or bad the relationship between the child and the tutor is developing.

What kind of learning information do you wish to know about your children? (Score, localisation …)?
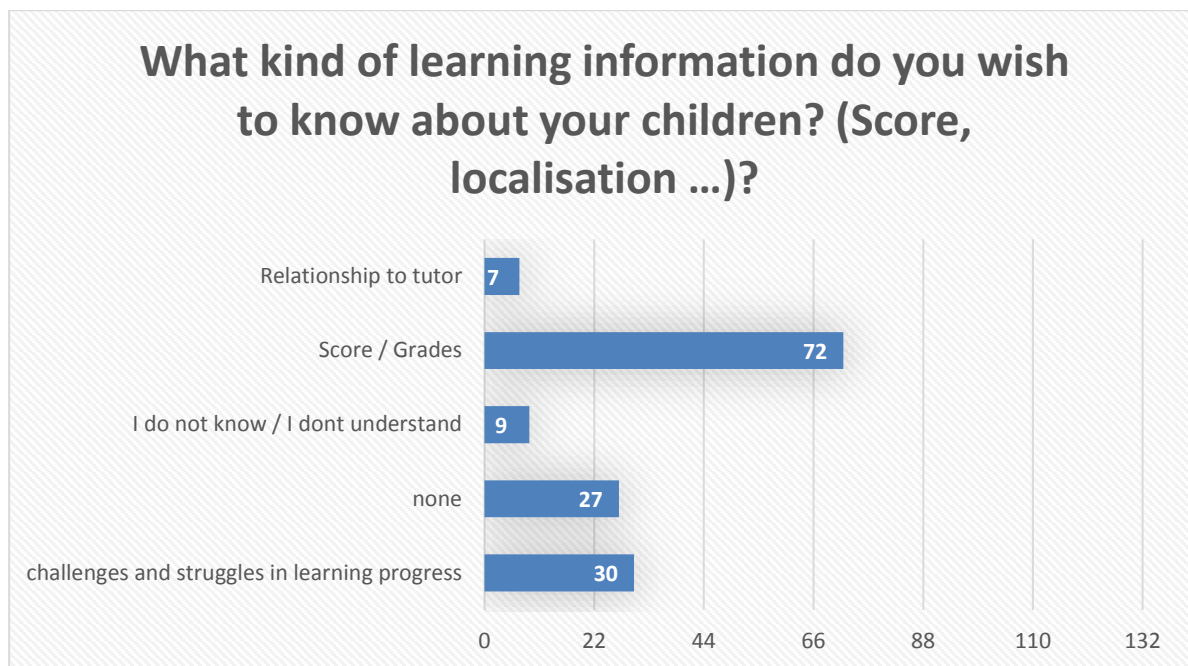
Figure 9: What kind of learning information do you wish to know about your children? (Score, localisation …)?

In this group, 71% answered that they would engage themselves in location based games, and even 86% would allow and support their children to participate, however 62% would not pay for such a game. Again these results differ from the internal group, with higher openness toward games.

Figure 10 shows that more than half of parents are expecting digitised lessons, tutorials and guidelines regarding Beaconing. About 12% of the parents are expecting hard copy materials and only 1% are expecting information regarding the platform. 6% of the parents did state that they are not expecting any kind of guidance or support material regarding Beaconing.

What kind of guidance/supporting materials do you expect from Beaconing?
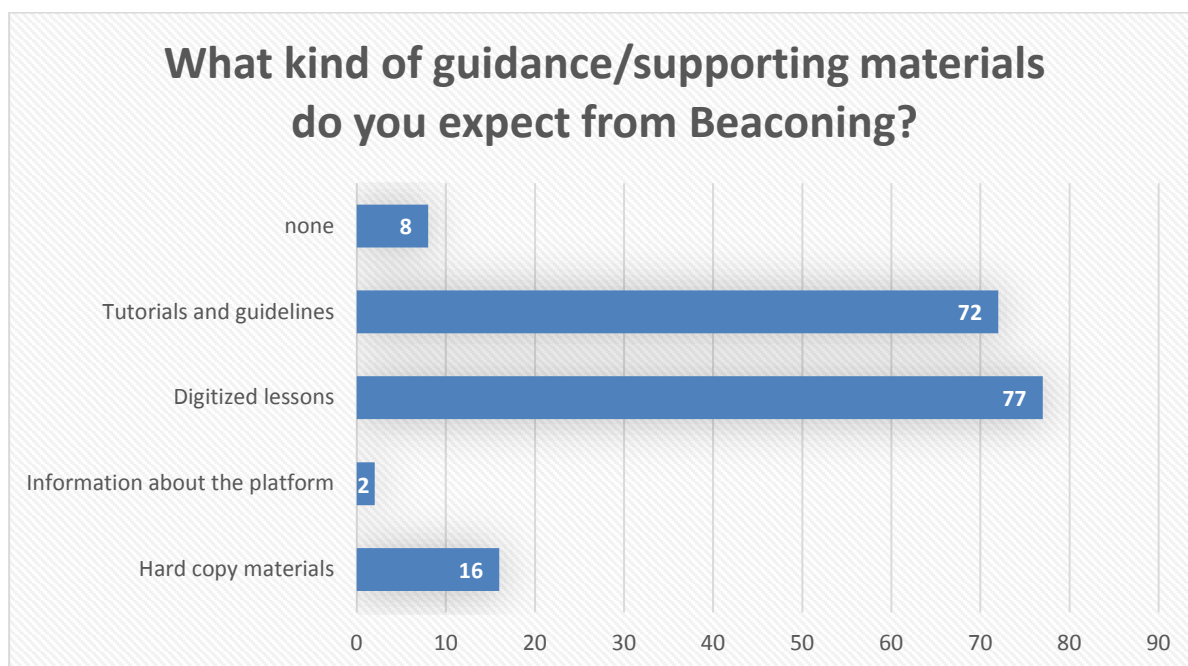
Figure 10: What kind of guidance/supporting materials do you expect from Beaconing?

3.1.4   Comparison

The results from the internal and external parents' questionnaires are, to some extent, divergent, therefore this section comprises of the results and analysis of the differences.

Looking at the perception about usefulness shows that the scepticism is higher in the internal group where over 60% think that educational games will not be helpful or have no opinion, whereas the external group conclude very differently and definitely think educational games are helpful (97% either helpful or very helpful). The large group in the internal having no opinion shows that more information about educational games, their limitations and their potential is required, but also in general to better inform under which circumstances games may have a positive effect on the learning progress and motivation of their child.

The results related to how often parents monitor their children's progress are similar. 65% to 75% of the parents look after the progress of their children at least once a week. 25% of internal parents are completely not involved in their children's school activities. This is also true for 5% of external respondents.

What would the parents like to know about their children's school achievements? 65% of internal parents would like to know the challenges their children face in school and if they are struggling in their learning process. This is much higher for the external ones where only around 22% are interested. For those, score and grades, were of more interest, followed by challenges they face and a minority would like to know about their relationship to their children' tutors. Additionally, more than 20%, both internal and external, do not want any information or do not know what information they would like to have.

A significant difference between the groups can be seen in their willingness to play with their children where internal would not engage themselves in a location-based educational game with their children (75% no). External parents asked would (71% yes). This continues in the differences related to if the children may participate - 35% of the internals would not allow, whereas 86% of the externals would allow. Only 20% (internal) and 38% (external) of the parents would pay for participation in a location-based educational game.

Related to special needs and impairments, the results show that Beaconing should support people with dyslexia (36%) and autism (20%), but also be adaptable for sight and hearing impairments.

The main security issues, most internal parents are afraid of are privacy and data usage issues, followed by misuse of the children's data, viruses or hacking. However, internal results show that these parents are less worried.

Between 30% to 54% of the parents expect tutorials and guidelines as material for guidance and support. Internal parents also prefer hard copy materials (25%) and information about the platform (20%), whereas this is less relevant for the external parents. Another big difference is on digitized lessons - a main outcome of Beaconing - only 5% wanted digitised lessons. External parents wanted digitised lessons for the support (57%). Consequently, it will be very important to engage the parents early in this process.

3.1.5   Summary

Educational games are regarded as helpful tools by external parents. The opinion of both groups diverge it comes to participating in a location-based game with their children. The majority of external parents would play, whereas the majority of internal respondents would not. Only a minority of both groups would pay for letting their children participate in such a game. The Beaconing consortium must therefore look at sustainable business models that will allow usage of such games, but with minimal costs.

Since the majority of parents check their children's progress at school at least once a week, tools that provide specific feedback is of interest, both score and challenge related. Some of the parents also mentioned that they wanted to get information about their children's relationship to their tutors. Those suggestions should be considered when developing the Beaconing platform.

The parents wish Beaconing to support learners with dyslexia and autism. They also expect Beaconing to provide tutorials and guidelines, hard copy materials and a fifth of them would like to get information about the Beaconing platform. The high number of internals wanting hard copies is important to bear in mind when the piloting starts since this will be a motivational factor for parents to allow participation.

The privacy of their children's data is very important for the parents.

3.2   ANALYSIS OF THE TEACHERS QUESTIONNAIRES

The following section first reports on the results from the teachers' questionnaire- both external and internal respondents followed by an analysis of the difference between the two groups.

3.2.1   Purpose and structure

The purpose of this section is to give an overview of the teachers' needs and requirements as well as their view of the current situation related to learning structures and the usage of ICT. The questionnaire comprised 37 questions. The questions cover the topic of network access and ICT infrastructure and social networks in general, usage of learning technology including serious gaming, and teachers' experience. Some questions cover the requirement they have on the Beaconing platform as well as questions related to the time they have to prepare and what sort of disability and impairments they deal with. The full questionnaire is in the annex.

3.2.2   Internal outcome

So far nine teachers have completed the questionnaire. Currently more teachers are recruited (WP 5). Therefore, an update will be available in November.

Figure 11 shows that most of the teachers use both LMS and traditional methods. However, only two of the respondents use digital education games. One also makes use of entertainment games and MOOC.
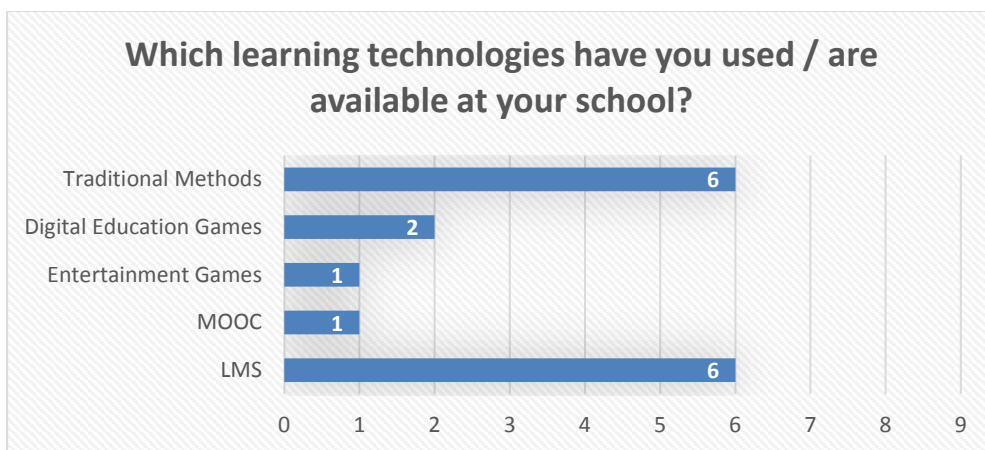
Figure 11: Which learning technologies have you used/are available at your school?

Taking into account that 67 % of the teachers are familiar with LMS, it is of high relevance to see what they would require from a new tool. Figure 12 shows user friendly interface and evaluation features are the two most relevant options. A third would like to have a facile user management system integrated, too.

Which features and reporting capabilities should a learning platform have?
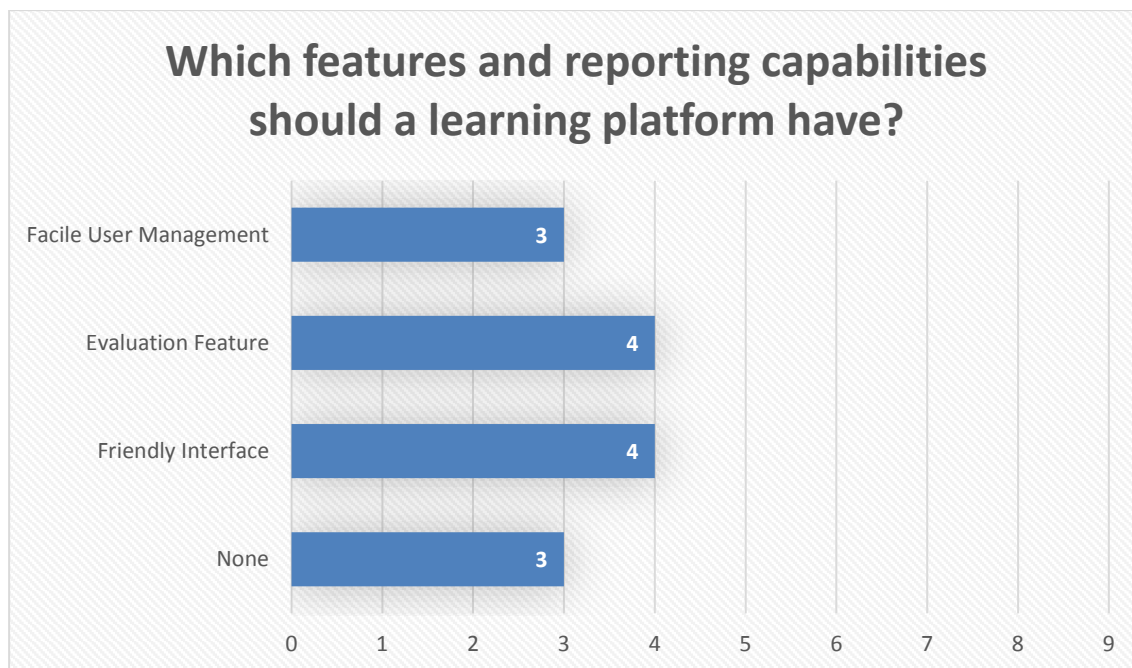
Figure 12: Which features and reporting capabilities should a learning platform have?

Regarding the engagement and motivating mechanisms, Figure 13 shows that more than half does not want any, whereas 44 % would integrate immediate feedback as well as different levels for increasing the engagement. Multiple answers were possible.

What engaging/ motivating mechanisms would you like to have?
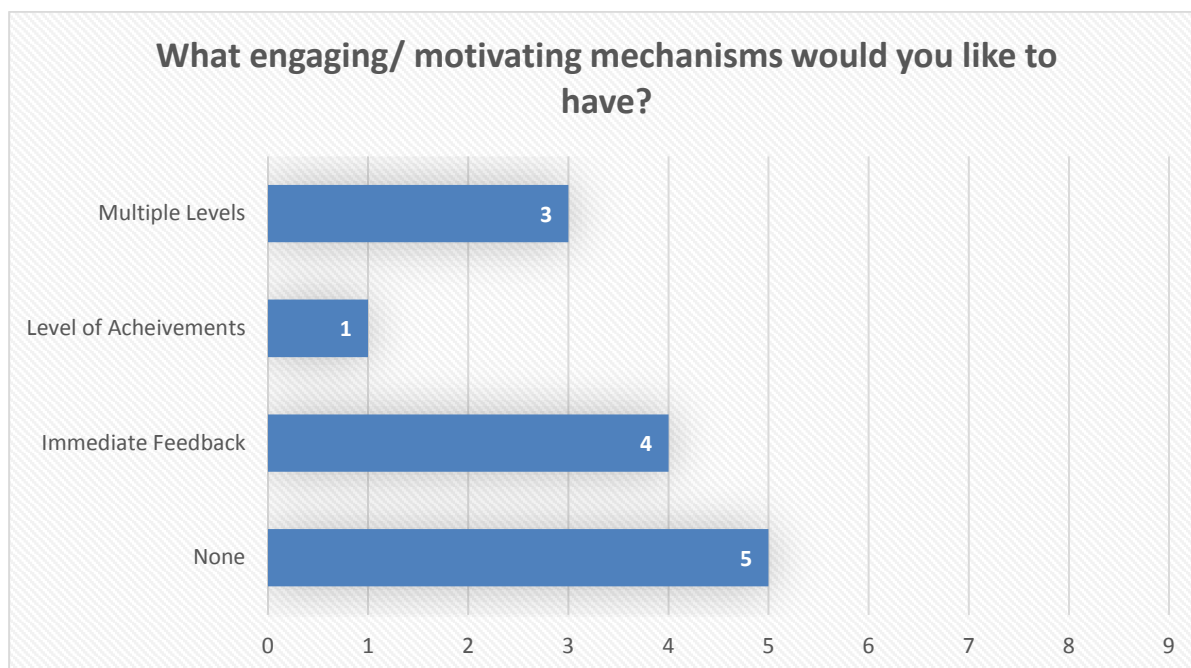
Figure 13: What engaging/motivating mechanisms would you like to have?

In Figure 14 the analysis shows that they expect support in different ways: besides the needed tutorials (however only 22% really require them), the majority expects digitised lessons followed by 44% who want to get hard copy materials and 22% of participants would like to get tutorials provided. Specifically, the need for hard copies will need to be considered, since that will limit the usage of the features like immediate feedback.

What kind of guidance/supporting materials do you expect from Beaconing?

Category	Value
Digitised Lessons	8
Hard Copy Materials	4
Tutorials	2
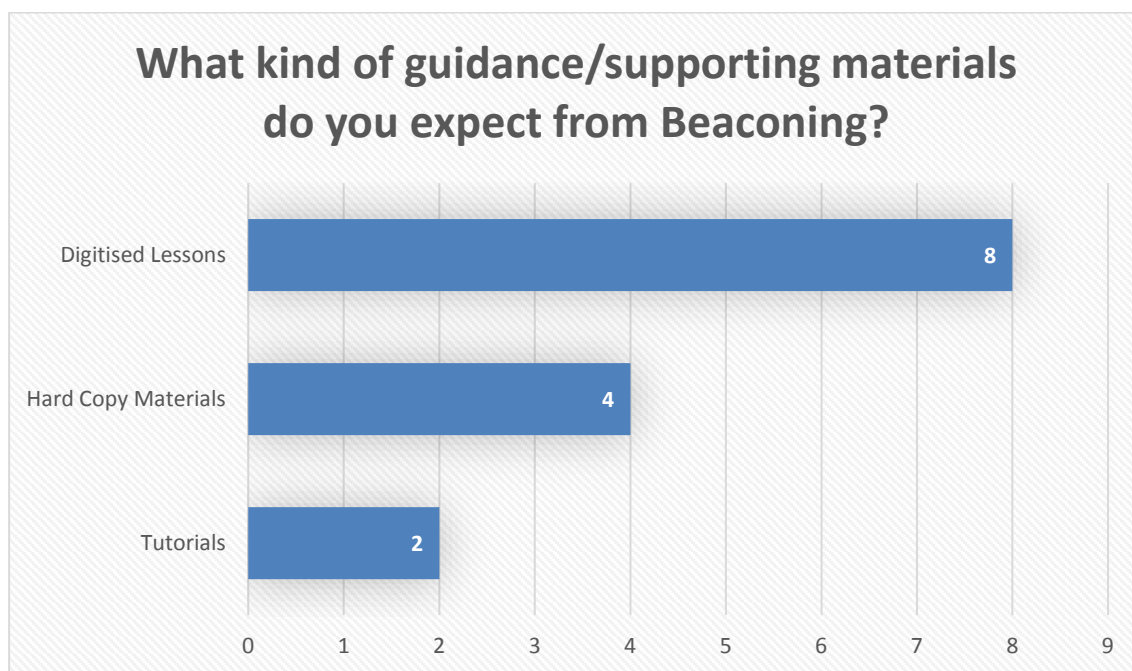
Figure 14: What kind of guidance / supporting materials do you expect from Beaconing?

Figure 15 indicates that chats and forum are seen as the most important communication means. These means are also suitable for collaboration among the students and between teacher and students. This is also common feature in many LMS, so teacher (recalling the high number of teachers using LMS) should be well familiar with it.

Which Communication feature you like to use?

Category	Value
Media Sharing	6
A/V Calls	4
Forum	8
Chat	8
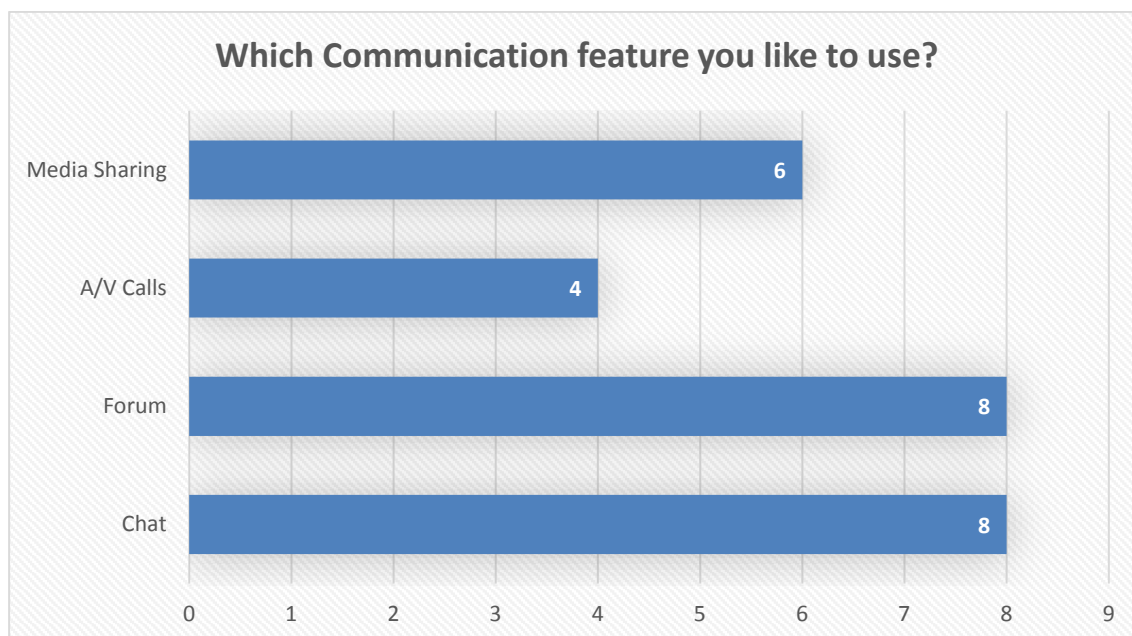
Figure 15: Which communication and collaboration features do you particularly like to use when being online?

The information in Figure 16 is essential for Beaconing. It indicates that the teachers see room for improvements, not only in the technical area related to the computers (33%) but also that there seems

to be a lack of trained teachers and not possible to give a differentiated education. This shows that it is necessary to look into how a curriculum can be better adopted to the needs of these users. Finally, there are also partly insufficient working conditions.
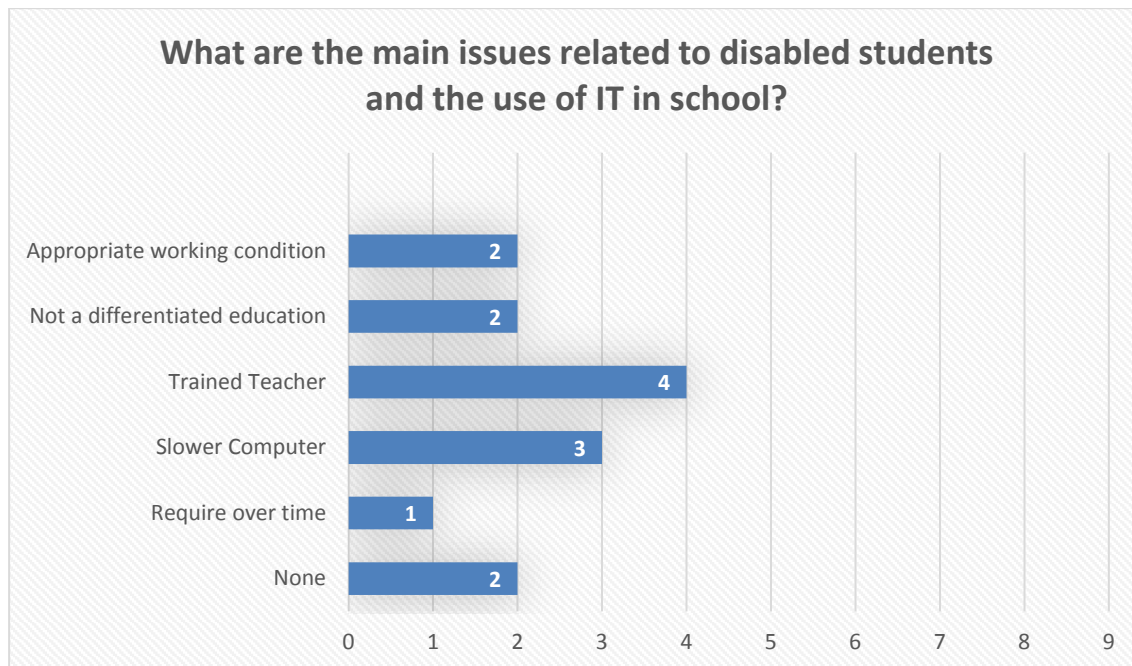
Figure 16: What are the main issues related to disabled students and the use of IT in school?

Only one of the interviewed teachers would like to provide support for learners suffering from deafness and visual impairments, all the others see no need for specific support for disabled children within the Beaconing project. This is very different from the results we saw in the parents' section, but it indicates that there are not many children with dyslexia and autism in the classes of these teachers, most probably not at the school at all, or that it is not seen as an appropriate tool.

Figure 17 shows which current assessment activities the interviewed teachers use: projects, tests, oral exams or presentations to assess their students. Only one of our internal teacher grades indicates that traditional or online methods are used. This shows that this sub-question was not clear to the teachers. One teacher indicates that he/she does not use any assessment means. Multiple answers were allowed.

Which kind of assessment activities / means do you use ?
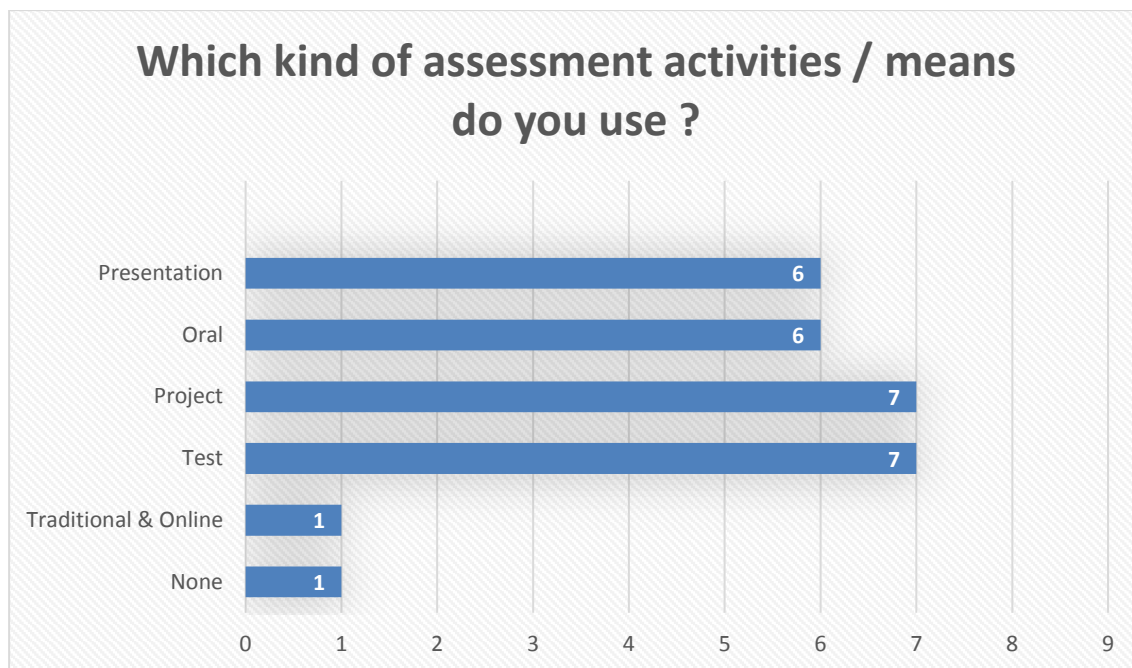
Figure 17: Which kind of assessment activities / means do you use?

Figure 18 is related to the preferences of their students. The answers indicate that studying and discovery is thought to be the most enjoyable activities. These answers need to be compared with the outcome of the students questionnaire in section 3.4 which is about the Technological and Content Providers.

What activities do you think your students enjoy most?
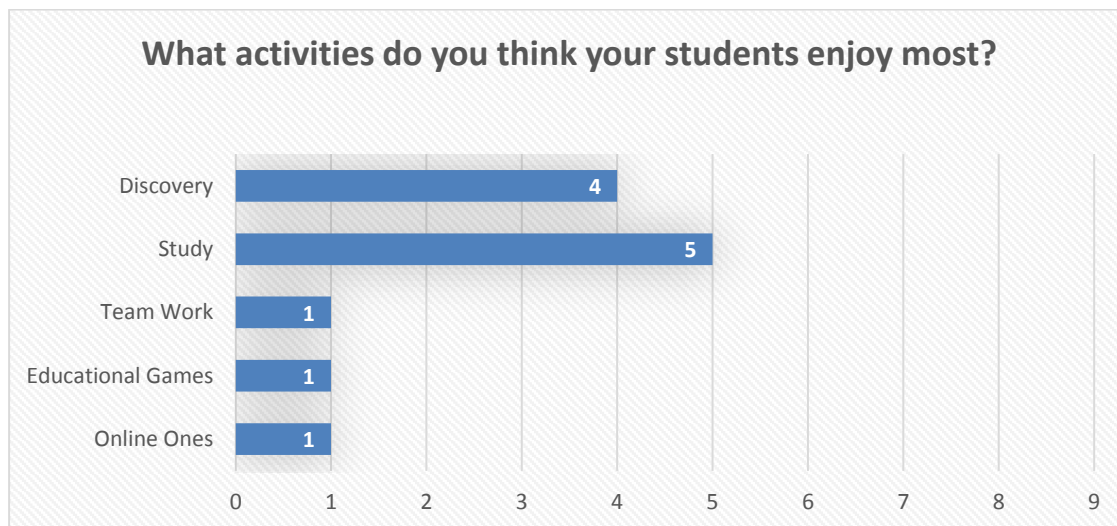
Figure 18: What activities do you think your students enjoy most?

The teachers were also asked how and where they prepare their classes. This is relevant for the architecture and the access to the Beaconing Platform. 100% of the teachers use a computer for the preparation.

More than half of the participants prepare their lessons using MS Office and a third use 3rd party services like Google services. Just one teacher uses multi touch devices for creating lesson materials.

Beaconing intends to also deliver a gamified component and games. This might cause more work and perhaps some training in case the teachers are not familiar with games- neither as a player nor with the

usage in an educational setting. Consequently, it is relevant to know what sort of games they are used to playing and what they have used for educational purposes.

Figure 19 shows all teachers have played a serious game at least once. These experiences are wide spread. The most common games used are news, educational and adventure games, followed by games for therapy, exercise and health games, as well as simulations. Serious games in the area of art and challenge were only used by one participant.
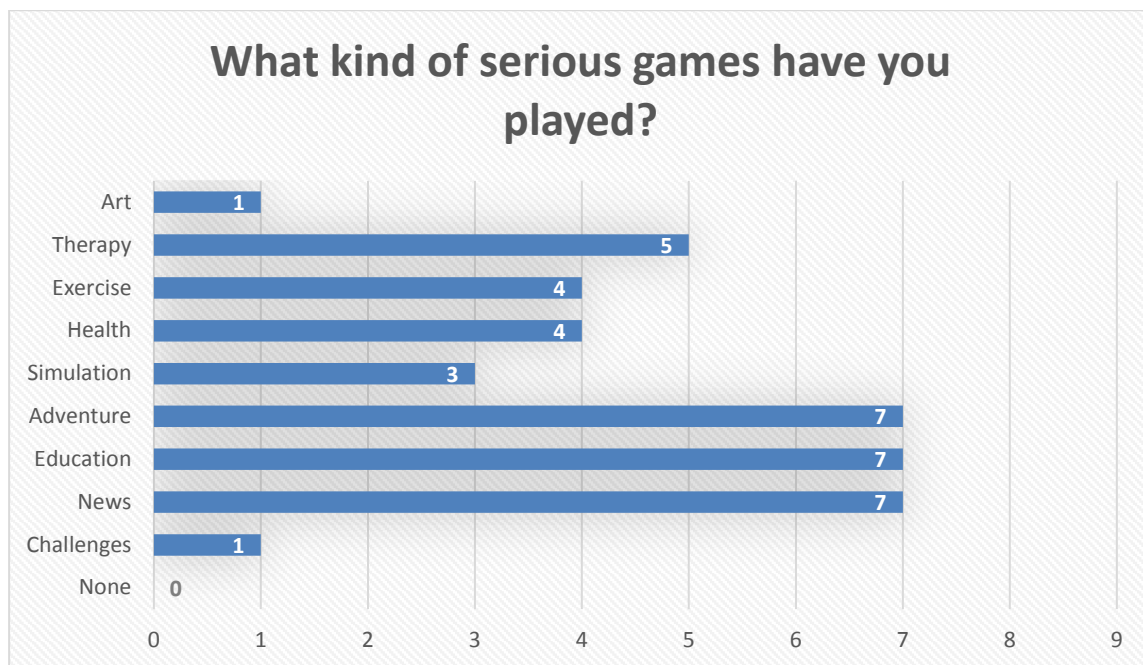
Figure 19: What kind of serious games have you played?

3.2.3 External outcome

The following section analyses the answers of the external teachers (i.e. not planned to be directly involved in the project). The answers were collected online, as well as by using printed questionnaires. 39 teachers involved participated in the survey.

Figure 20 that almost 2/3 of the teachers state that they use digital educational games in their schools. Some of them also make use of entertainment games. Half of the participants use a LMS and 23% use open online courses.
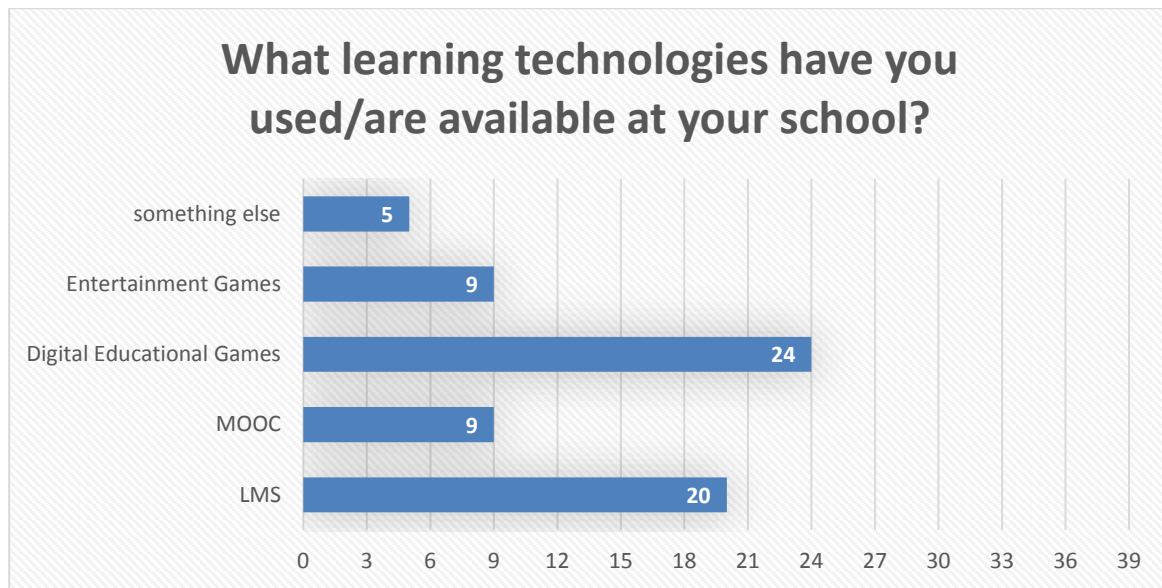
Figure 20: What learning technologies have you used/are available at your school?

Regarding the features and reporting capabilities, Figure 21 shows there are divergent opinions. The most important features are easy, fast and intuitive usage, as well as provision of analytics for tests, followed by reports on learners. The content, cross platform availability and colourfulness are also on the wish list among some of the teachers, whereas multi-lingual features is hardly relevant.
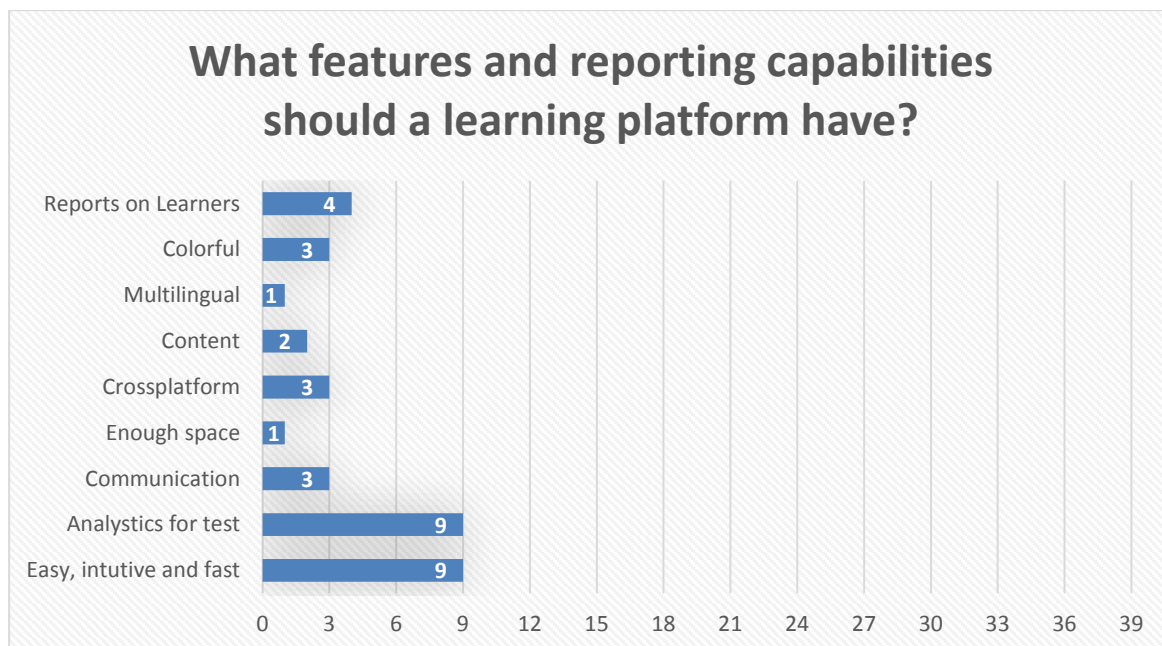
Figure 21: What features and reporting capabilities should a learning platform have?

An important aspect of the Beaconing platform is related to the ability to engage and motivate the users better than today. Figure 22 indicates that games are considered as a motivational factor by this external group, whereas it was hardly seen as relevant by the internal teachers. Also a user friendly platform, feedback, achievements and winning conditions are also suggested mechanisms for engagement. Only a few participants think that hard copy materials, presentations, workbooks, media or collaborative tools are engaging mechanisms for their students. 8% would like to use digitised lessons to motivate their pupils.

What engaging/motivating mechanisms would you like to have?
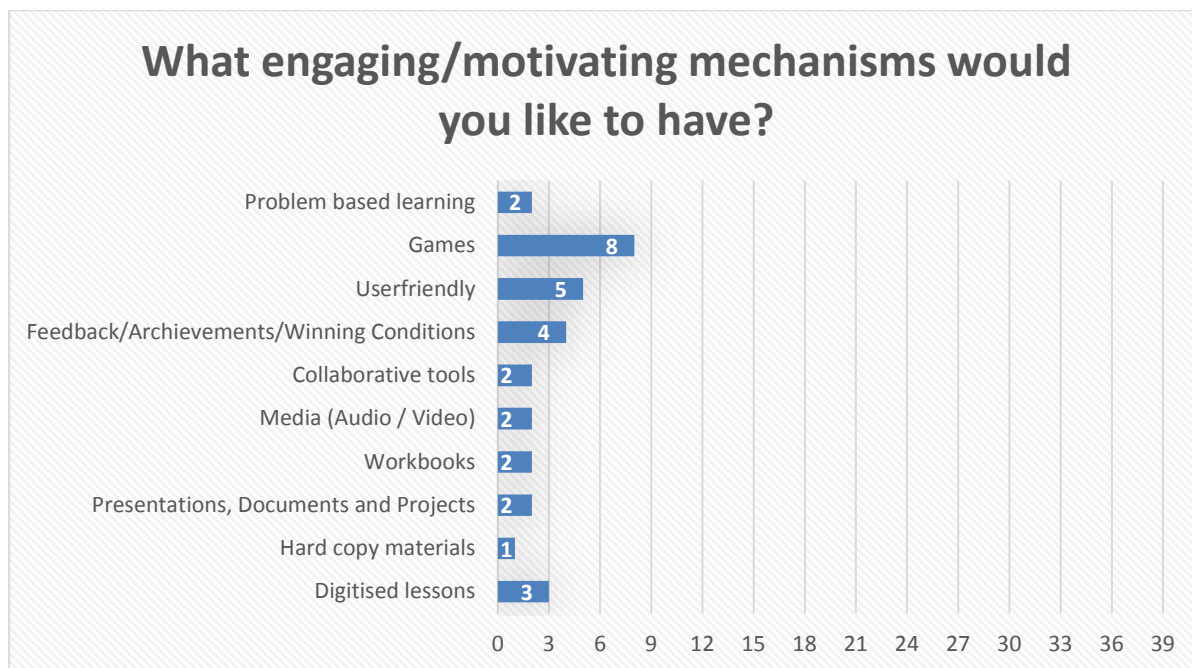
Figure 22: What engaging/motivating mechanisms would you like to have?

The analysis of Figure 23 shows that over 2/3 of the teachers think that Beaconing should support them by providing tutorials followed by digitised lessons. Only a few respondents expect Beaconing to provide hard copy materials, games or examples.

What kind of guidance/supporting materials do you expect from Beaconing?
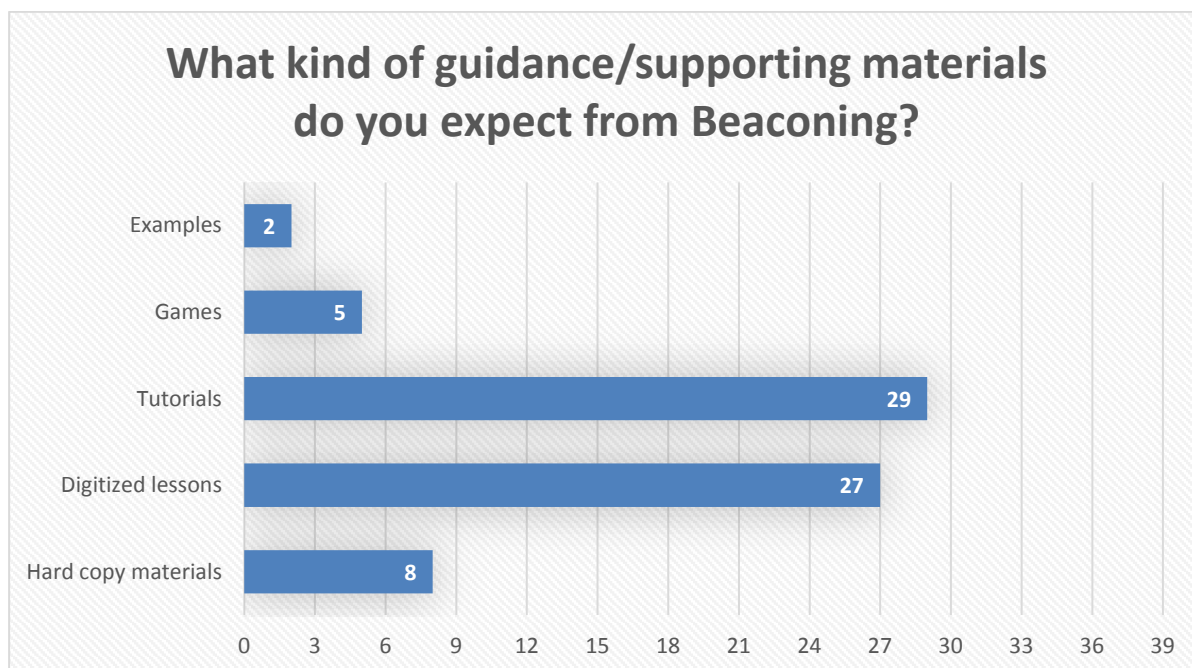
Figure 23: What kind of guidance/supporting materials do you expect from Beaconing?

In Figure 24 we can see that almost 2/3 of teachers think audio video calls are the best way to communicate, closely followed by chats and forums. 41% of participants would like to use media sharing to communicate with their students.

Which communication features do you like to use?
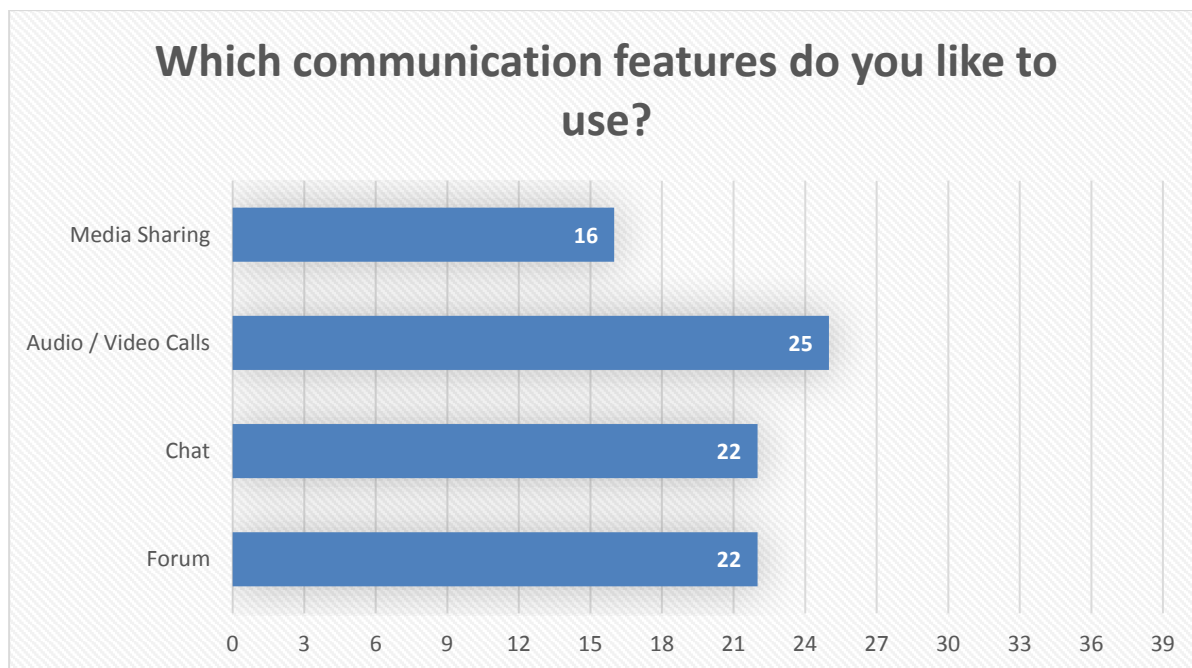
Figure 24: Which communication features do you like to use?

According to Figure 25, the main issues related to disabled students and technology are related to their learning abilities, their way of memorising and thinking as well as a lack (23% indicates this) of specific software and hardware. This is an area where the Beaconing partner, Hands Free Computing, has vast experience and suitable solutions that could solve the latter issue to some extent. Again, the results also show that some teachers do not teach any students with disability.

What are the main issues related to disabled students and the use of IT in school?
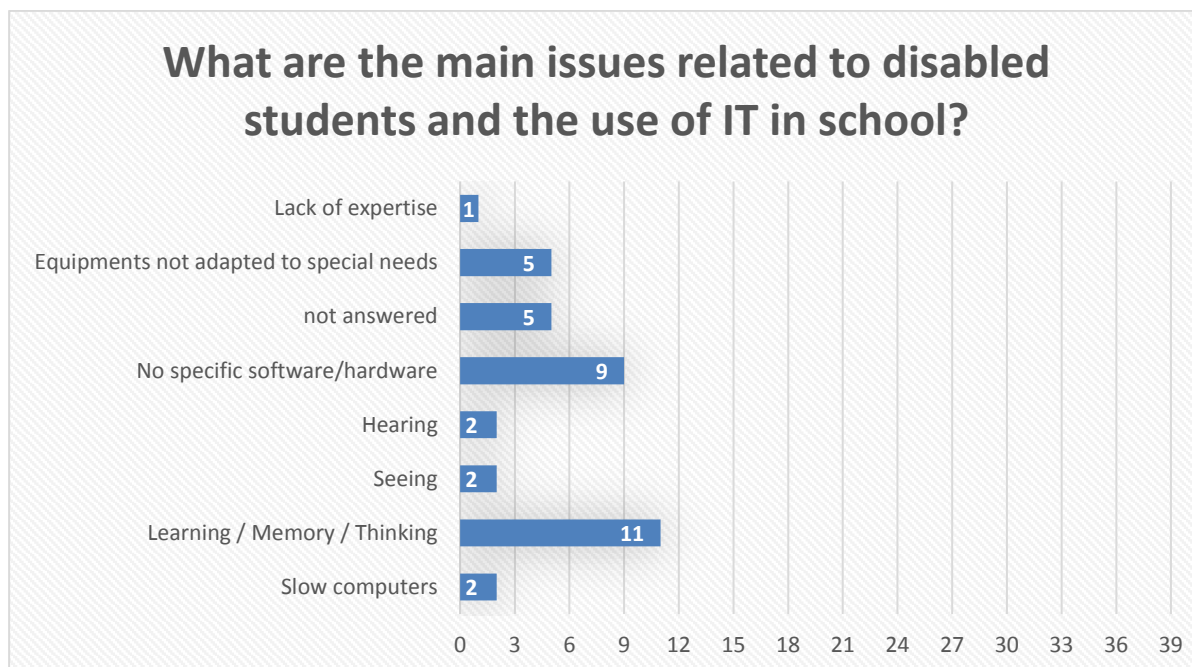
Figure 25: What are the main issues related to disabled students and the use of IT in school?

Figure 25 indicates the disabilities that Beaconing should support. It differs quite significantly from the internal teachers' answers, but is quite in line with the parents' answers. The most important are

dyslexia followed by the ones suffering learning disabilities. 18% state that physical disabilities and 13% visual impairments are to be aided by the platform. Autism and hearing impairment seems less relevant to this group. Again, it was possible to select more than one answer.
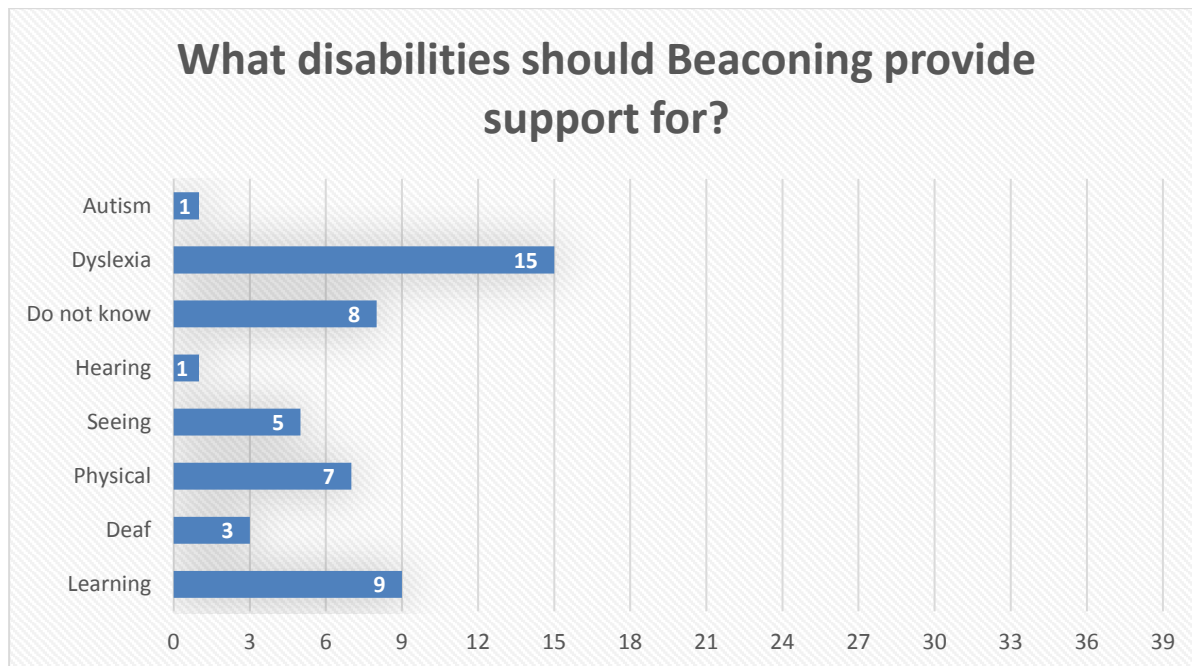
Figure 26: What disabilities should Beaconing provide support for?

Regarding how students are currently assessed, 2/3 answered that they use analogue tests to grade their students. Only a small minority use online tests or reports.

Beaconing is largely based on problem based learning, Figure 27 indicates that this method as well as other experiential learning methods seems to be the most enjoyable activities for the students. This is very much in line with answers in other studies.
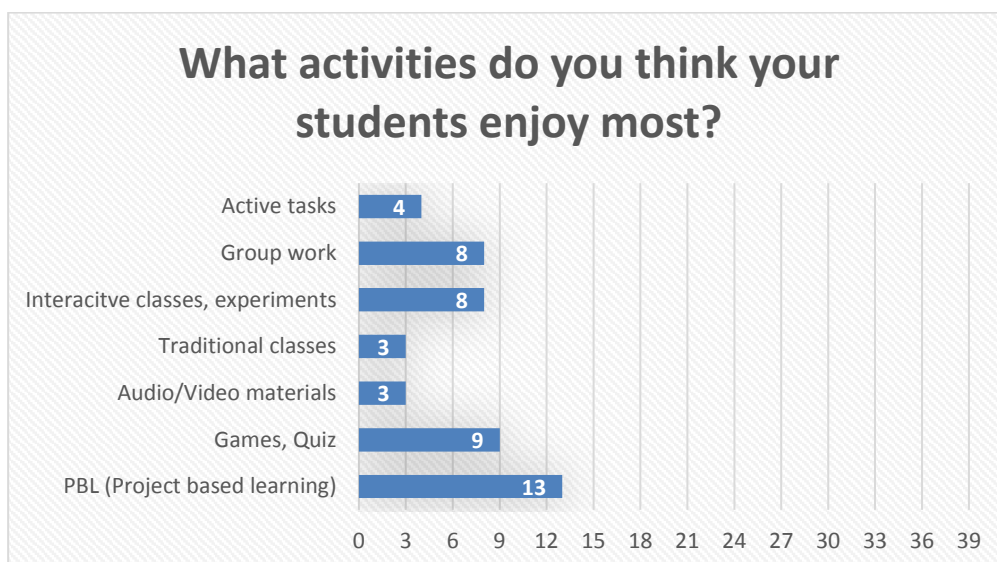
Figure 27: What activities do you think your students enjoy most?

Figure 28 shows that most of the teachers have experience in playing serious games. This will ease the introduction of a gaming component as a part of a lesson plan and also as a tool for teaching.

What kind of serious games have you played?

Category	Value
something else	3
Simulation game	4
Productive	2
Challenges	14
Adventure	15
News, Education	18
Health, Exercise, Therapy	13
Art	16
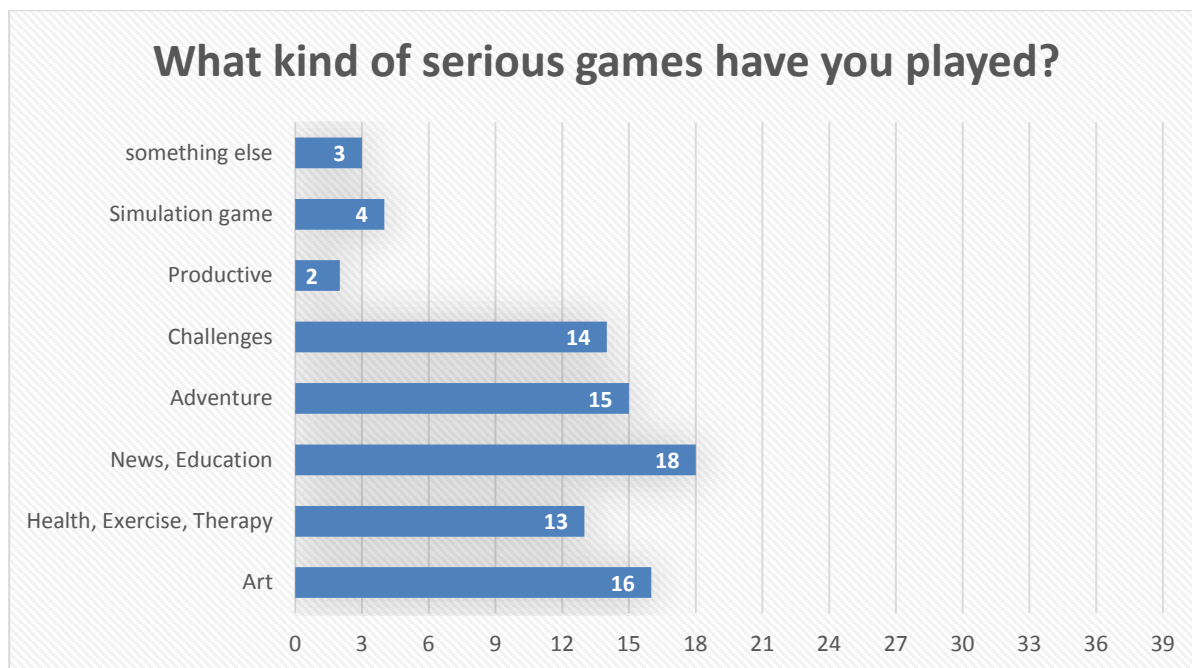
Figure 28: What kind of serious games have you played?

3.2.4   Comparison

Altogether, 48 teachers have completed the questionnaire. This chapter compares the results of the internal (n=9) and external (n=39) answers and analyses the differences. The comparison and the trends followed by internal and external are as follows:

While about 2/3 of external participants use digital education games in their schools, these are hardly practiced in the internal group who still depend on using traditional teaching methods. On the other side, the usage of LMS system is much higher among the internal group than in the external group (around 50%). As a main requirement the high usage of LMS will require that the Beaconing platform is interoperable with the existing LMS. Tools like MOOCs or entertainment games have a low uptake rate in any of the groups.

Regarding the features of the Beaconing platform, it is required that the interface is easy to navigate and user friendly. The internals groups would expect the platform to provide assessment and evaluation features. This is slightly different from the external group that are more interested in learning analytics for testing, and to some extent also to generate reports on learning- that corresponds to the need for evaluation features among the internals.

Immediate feedback, followed by multiple levels is important for internal teachers to have for motivating their students. Achievements are secondary for both internal and external interviewees. Games are suggested by external participants to be engaging for their students, followed by user friendliness. More suggestions were to include digitised lessons, collaborative tools and problem based learning.

Both groups of participants would like to have support with digitised lessons by the Beaconing project. The majority of external teachers also wish for tutorials, while only 22% of internals expect them. Only about 20% expect hard copy materials, while almost half of the internals would like to get them. Some of the external respondents also would like to get access to games and examples.

The most common tools for communication used by external teachers are audio video calls, closely followed by chats and forums whereas these two are the favourite tools of the internal teachers.

Internals also prefer using media sharing, while only 41% of external respondents use this for communicating.

The main issue related to disabled students and their use of IT in school is according to internal teachers the lack of trained teachers, whereas external teachers rather think it is due to their learning difficulties and thinking impairments, followed by missing specific software and hardware. Internal respondents blame slow computers and poor working conditions.

Internal participants would like Beaconing to support users with deafness and visual impairments. The majority of external teachers add the support of learners suffering dyslexia, followed by learning difficulties and physical impairments.

Among external teachers, analogue tests are very common to assess and grade their students. Just a minority uses formative and summative assessments, online tests, discussions and presentations for scoring. The majority of internal respondents take, besides analogue, also presentations, projects and oral exams into account when it comes to grading.

The teachers have very different opinions on the question what their students enjoy most in school. Most of the internal interviewees think that they enjoy studying and discovery. 1/3 of the external teachers state that project based learning is something their students like to do, followed by games and quizzes, group work and interactive lessons, like experiments.

All of the internal participants use a computer to prepare their classes, whereas only half of the externals use PC's. 18% use traditional tools and only 13% use MS Office. In contrast, more than half of the internal teachers use MS office for class preparation and 1/3 also uses Google services. Books are only used by 10% of the external interviewees.

Every respondent has already played a serious game at least once. The majority of both groups played news and education games, adventure games and games used in health and therapy. Simulation games are not as common.

3.3   ANALYSIS OF SCHOOL QUESTIONNAIRES

This Chapter shows and discusses the results of the questionnaires which have been sent to internal and external schools. There were 27 questions related to technology, infrastructure and learning systems.

3.3.1   Purpose and structure

This chapter gives an overview of the services and infrastructures provided by the different schools. Furthermore, we also collect their needs, expectations, perspectives, priorities and preferences regarding the learning system which will be helpful to design the Beaconing platform in an optimal way for usage. The main target group here was school administration. So far 3 internal schools and 16 externals have participated.

3.3.2   Internal outcome

In this sub-chapter we show the answers of our 3 pilot schools administrations in the following figures. Even though the internal teachers answered that they hardly used games and MOOCs in their classes, the results from the administration shows that 2 schools have this in place, and in line with the teachers' results, all schools have LMS. Regarding the hardware, the results shows that 2 of the 3 schools have desktops, and one school offers laptops, white boards or multi touch devices, whereas one school administrator did not answer this question.

The costs of internet usage varies- whereas one school pay around 100€ a month for their internet connection another says the costs are covered differently, but altogether these costs are of minor relevance.

As in the previous section, the most important feature and capability is that is user friendly interfaces and that all participating schools use forums to communicate with their students. 2 of them also use media sharing and A/V calls, whereas one school uses chats to keep in touch with their students. This communication channel needs to be an integrated part of the Beaconing solution and for one of the school administrations (lower than expected) requires compliance with regulations whereas a different sees a need for integration of real-life situations in the learning platform. Regarding how to store the data, all schools state that this can be done in a cloud solution. One school also would store them locally. It has to be noted that privacy and security issues are of great concern for the school, so that third party access is difficult.

3.3.3 External outcome

16 school administrations have responded to our questionnaire so far. Almost 70% of participants use digital educational games in their schools. Half of all respondents use an LMS (i.e. much lower than in the internal, with 100%), whereas MOOC's, ARLs, e-learning and video/audio materials are hardly used. Also the available hardware differs from the previous group. Figure 29 shows that the majority of schools have laptops in their schools followed by desktop computers, tablets and multimedia. Only a few use various devices like smart boards, smartphones, networks, webcams and printer in their schools.
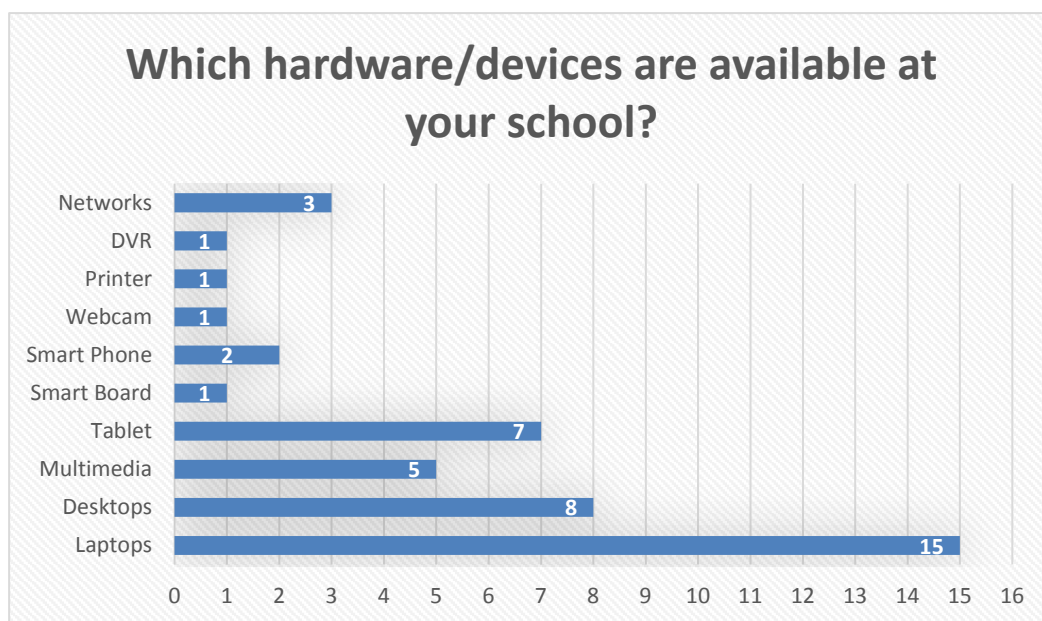
Figure 29: Which hardware/devices are available at your school?

As for the internal schools, the internet costs are of minor relevance, but they handle it differently. One school finances their internet connection through local funds; others use a flat rate or use their school budget for it.

The 16 schools have different opinions (multiple answers possible) about the features and reporting capabilities to the Beaconing platform (Figure 30), so that no clear requirement can be identified from the school perspective. This indicates that the teachers' and students' needs are of higher relevance for this question.

Which features and reporting capabilities should a learning platform contain?

Personalized — 2
Learning Progress — 2
Gaming Knowledge — 1
Not Answered — 4
Feedback — 4
Testing — 1
Database — 1
Efficient & Accessible — 3
Easy to Use — 2
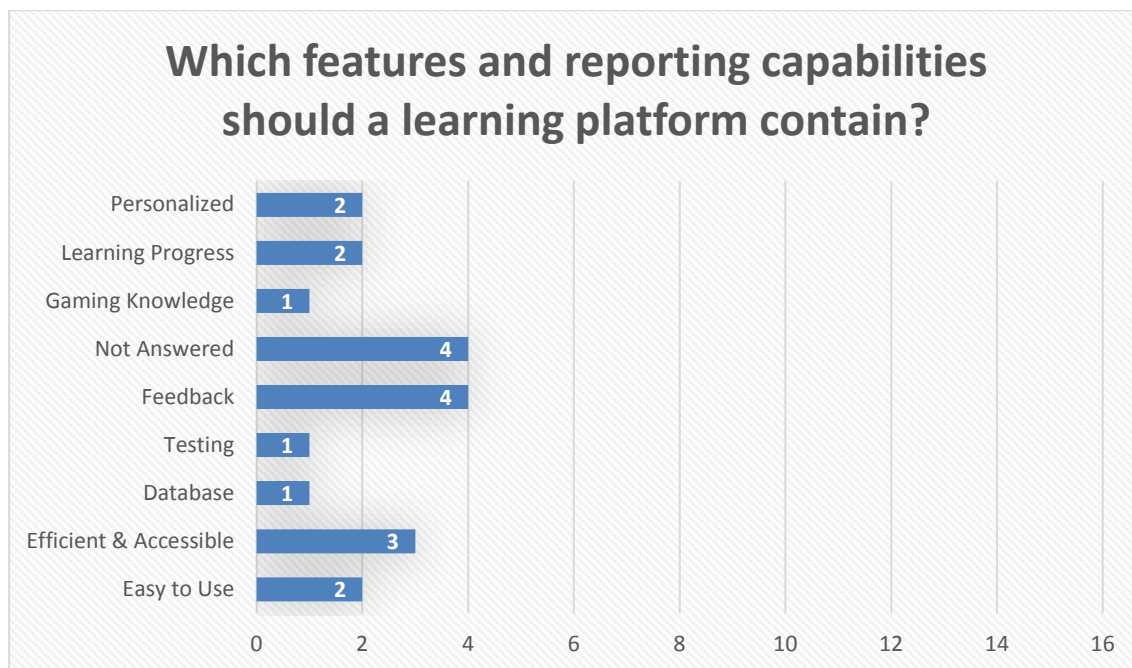
Figure 30: Which features and reporting capabilities should a learning platform contain?

The majority of the external school administrators like to use audio video calls as collaboration feature. About half of the respondents also use chats and forums, followed by media sharing.

Also the answers on most urgent needs give no clear picture, but 20% indicates that the level of access is the most important requirement from the administration site. This might be seen in the connection of the way they store data- 75% wants to store them locally, 31% go for cloud and 6% states that the way of how to store their data depends on their type. Multiple answers were allowed. Regarding security and privacy Figure 31 displays that half of the participants are concerned about personal data, followed by passwords, hacking and restriction of students' access.

What are the main security issues?

Personal Data — 8
Not Answered — 4
Student Access restricted — 1
Hacking — 1
Password — 2
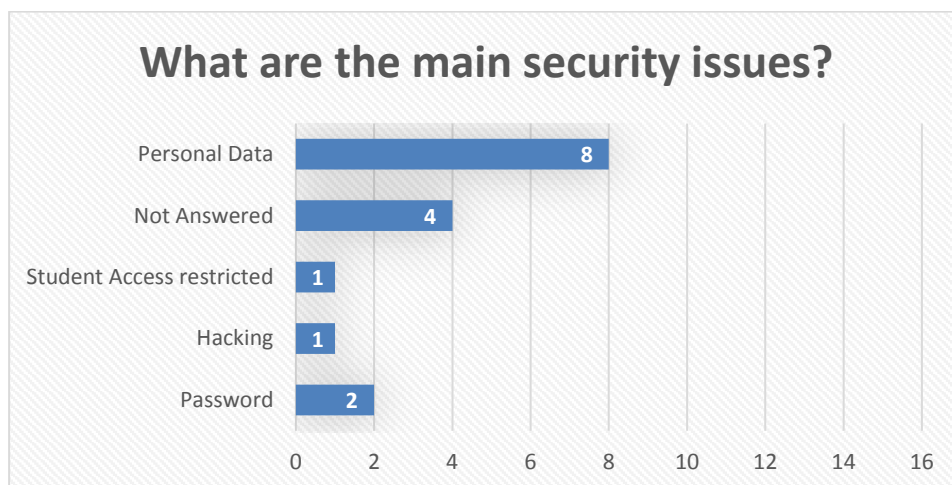
Figure 31: What are the main security issues?

3.3.4 Comparison

This sub chapter describes the differences between the internal and external school's administration and the similarities and dissimilarity that can be seen in their schools.

The first difference between the internal and external school's administration is the choice of learning technologies they are using in their schools. Internals prefer Learning Managements System and then

MOOC and digital education games while 69% of external respondents prefer digital education games at first and then 50% of participants use a LMS. Furthermore, one of the externals also uses different types of technologies like e-learning, video and audio material and AEL.

Desktop and laptop computers are available in most of the interviewed schools. In external schools there is a lot of different hardware available for usage, such as tablets (44%), multimedia (31%), networks (19%) and smartphones (13%), while internals just make use of some items, like white boards and multi touch devices.

Internal schools use different types of technological platforms such as educational forums, the internet and MS Office, while externals use a wide range of technology, such as diverse operating systems as a technological platform followed by virtual labs, LMS, AEL, Google services, MS Office and many more other third parties' software.

It can be seen that the costs of the internet connection is around 100€ per month or balanced for the internals while externals manage it via school administrations, use their school budget or get local funds.

The feature of feedback and accessibility is the most important thing externals think a learning platform must have, followed by the ability to personalise it and to track the learning progress. The internal administrations have equally voted that a learning platform must have a user friendly interface and the ability to overcome any difficulty.

Internal administration of schools assume that forums are the best way for communication while the majority of externals consider audio video calling as the best way to communicate while being online. Externals voted chatting in second place while internal schools do not seem to like using them. Half of external respondents like using forums for communicating with their students.

Requiring compliance with the regulation authorities and the real life situations are the most important needs for internals. Although most of the participants from the external group did not answer the question a few say the level of access, non-violence, learning needs and socializing needs are important.

There is a very contrary meaning when it comes to the storage of data, because internals prefer to store most of the data in cloud based services, while one quarter of externals save it locally. Just a few of school administrations think that it depends on the data whether to store it in the cloud or locally.

When asked about the security issues respondents agree in believing that personal data, hacking, passwords and privacy for student and teachers are the main security issues nowadays.

3.4 ANALYSIS OF THE TECHNOLOGICAL AND CONTENT PROVIDERS

Beaconing is an innovation action and will therefore provide quite mature solutions at the end of the project with a TRL of the components and the system between 7 and 9. The idea is that it will be possible for other companies and NGOs to get involved to either connect and integrate their products into Beaconing or to put the Beaconing solution to their local market (more details, as well as the business modelling is to be found in WP 7 at a later stage of the project). It is therefore important that we get some indication of what such companies see as a market opportunity and which business models they at first sight would favour. So far, 29 external companies contributed. Of course, all internal Beaconing industry partners have already an interest in commercialisation (see WP 7 and DoA).

Figure 32 shows preferred business models for location based games in general, and it shows that 50% finds Pay per Use business model on Location based games as most suitable, while 17% prefer Monthly fee. 13% favour a SaaS (Software as a Service) business model, 10% had no opinion and 7% would favour licensing.
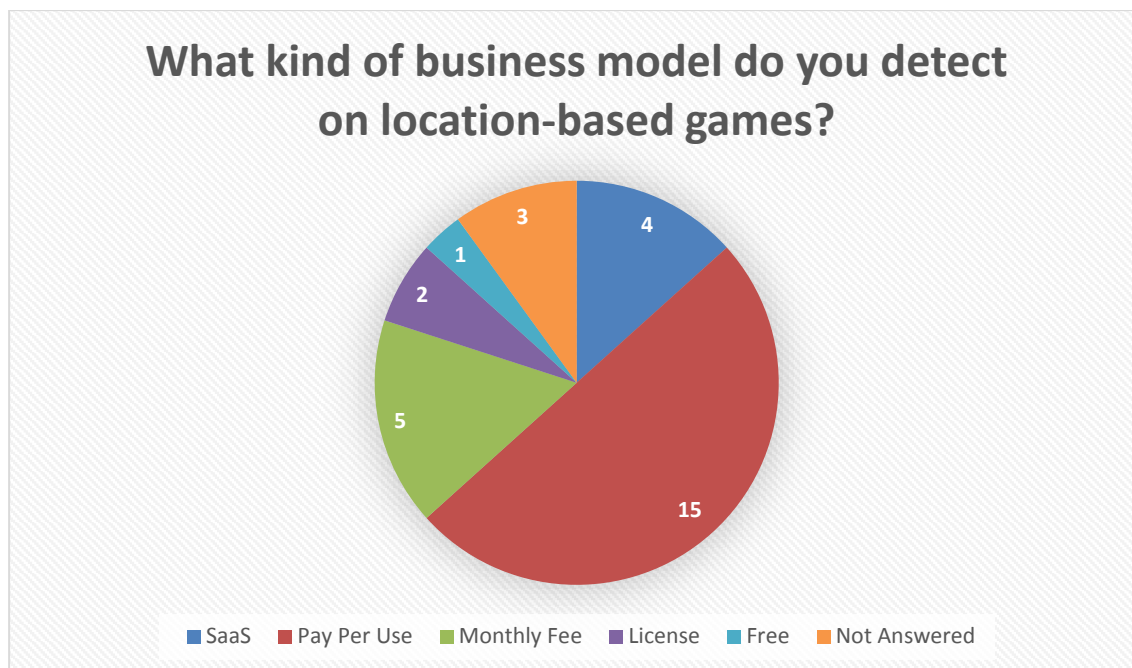
Figure 32 What kind of business model do you detect on location-based games?

This is different to their answers on business models for location based educational games for which 39% favour licensing, while 29% prefer SaaS, 21% would go for monthly fees, and 11% says that by selling the product. These answers are in line with the results found in different publications [3, 4]. 55% of the respondents would allow access to their location based data, which could be used in order to provide an automated access to local solutions. These findings will be elaborated further in WP7, D7.1 which is the technology watch.

3.5 ANALYSIS OF THE STUDENT QUESTIONNAIRES

Beaconing is offering a pervasive and personalised learning environment for students between the ages of 16 to 24 with and without special needs. The Beaconing learning environment will not only be accessible at school, but is designed to support learning everywhere – i.e. school, home, outside etc. Therefore, the students are asked about their needs and preferences in different situations.

3.5.1 Purpose and structure

The previous sections outline the requirements on Beaconing from teachers, schools, industry and parents. This section describes the last part of the requirements analysis- the results from the students' questionnaire. These preliminary requirements will be updated mid-term in the project, after they have had the possibility to test the Beaconing platform.

The questionnaire was developed as described in section 2 and comprises 4 sections. It is similar to the one of the teachers and the parents. Section A covers (7 Questions) administrative information. Section B (4 Questions) is related to learning and STEM subject. Section C covers various aspects of technology and the personal usage. This is relevant in order to make sure that the solution we provide can be used at the students' personal devices. Section D (11 questions) deals with the students' relation to games, both learning and entertainment games. In this version of the deliverable, 65 fully completed questionnaires are analysed.

3.5.2 Internal outcome

This section gives an overview of the students' motivation as well as issues related to learning. The complete set of data is in the online storage, the section below gives a detailed overview of the most important results for the Beaconing solution.

Figure 33 indicates the challenges studens face in their learning activities. More than half of the responding students reports that a major issue is the motivation. This is a factor to which the pervasive approach in Beaconing can directly contribute. Also the adaptability of our platform may contribute to overcome this.
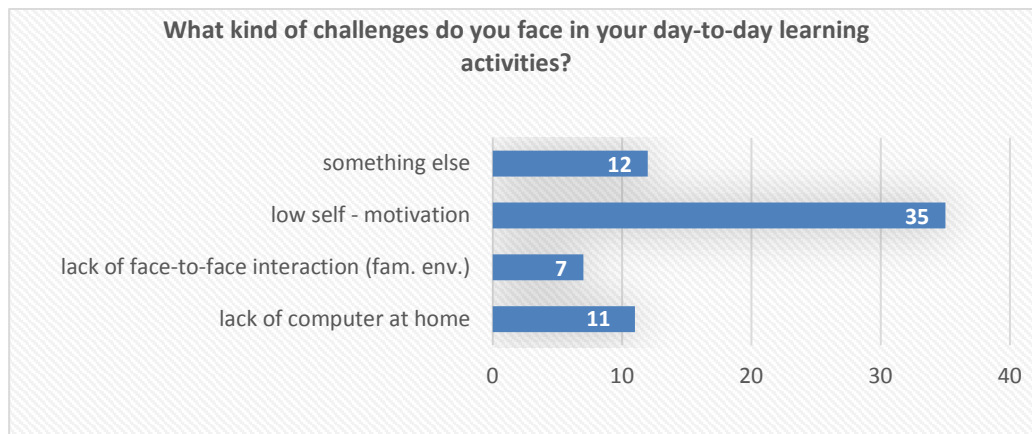
Figure 33: What kind of challenges do you face in your day-to-day learning activities (at school, home and beyond)?

Figure 34 shows that the majority (63%) prefers to learn STEM subjects by practicing, computer and problem based learning. Games are only considered as the preferred way by 13% whereas only 10% favour face-to-face interaction and internet.
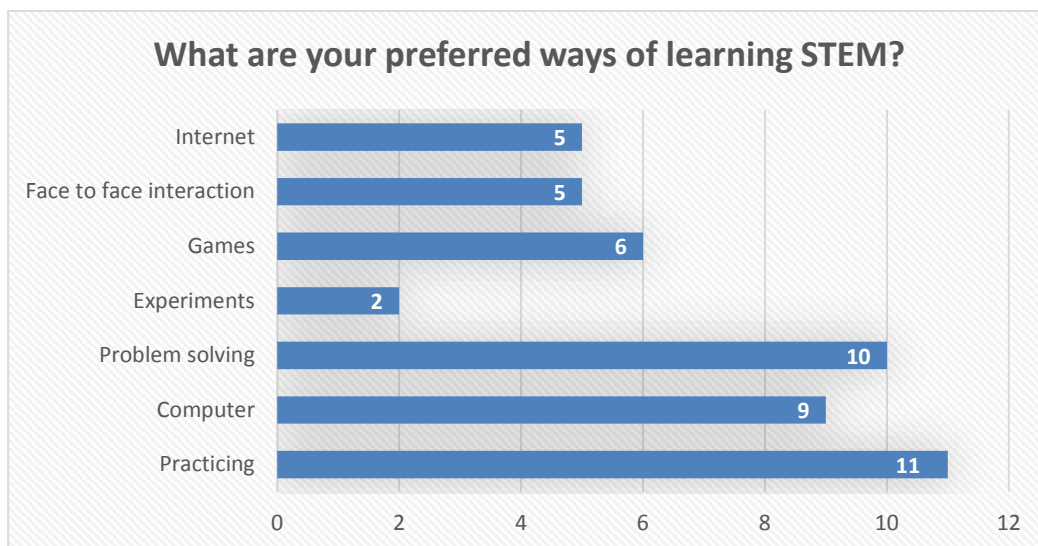
Figure 34: What are your preferred ways of learning STEM?

The main communication means for the students is chat with 59% followed by audio and video calls with 26%. 12% prefer media sharing and 4% forum.

Parents, teachers and also the students were asked what kind of guidance and support materials they would like to have in Beaconing. The most appreciated are Tutorials (47%) and Digitised lessons (48%) while hard copy materials were less interesting, only 4 students wanted this choice. A major concern is

often related to anonymity and digital identity. This is confirmed by our internal students, as 21 answered 'very important', 18 'important'. However, 13 replied 'unimportant', 5 'did not know'.

Figure 35 shows that 28 of the students have access to LMS whereas 12 can use educational games. This is the double of those having access to entertainment (6), 8 also have access to MOOCs.
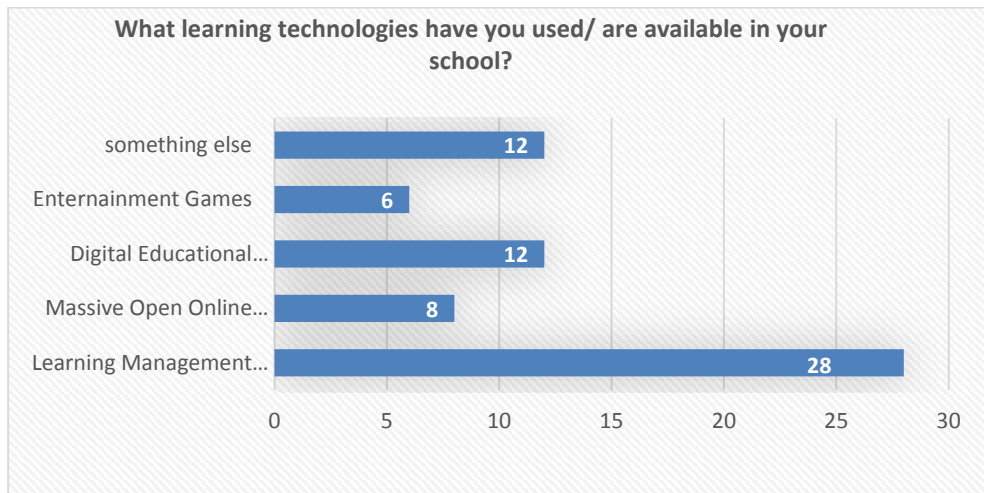
Figure 35: What learning technologies have you used/ are available in your school?

89% of the students play games in general. 60% (39) have played games specifically designed for learning, 7 were not sure and 19 had never played educational games. In order to know a little bit more about the preferences of the students related to games, they were asked to mention their three favourite games. FIFA and Counter Strike were the two games most played. This might also be because these are available in all countries. However, it is also in line with the type of games the students favour (Figure 36) 75% of the internal students said they like Adventurous, Simulation and Challenging type of serious games and for the rest it was a mixed response.
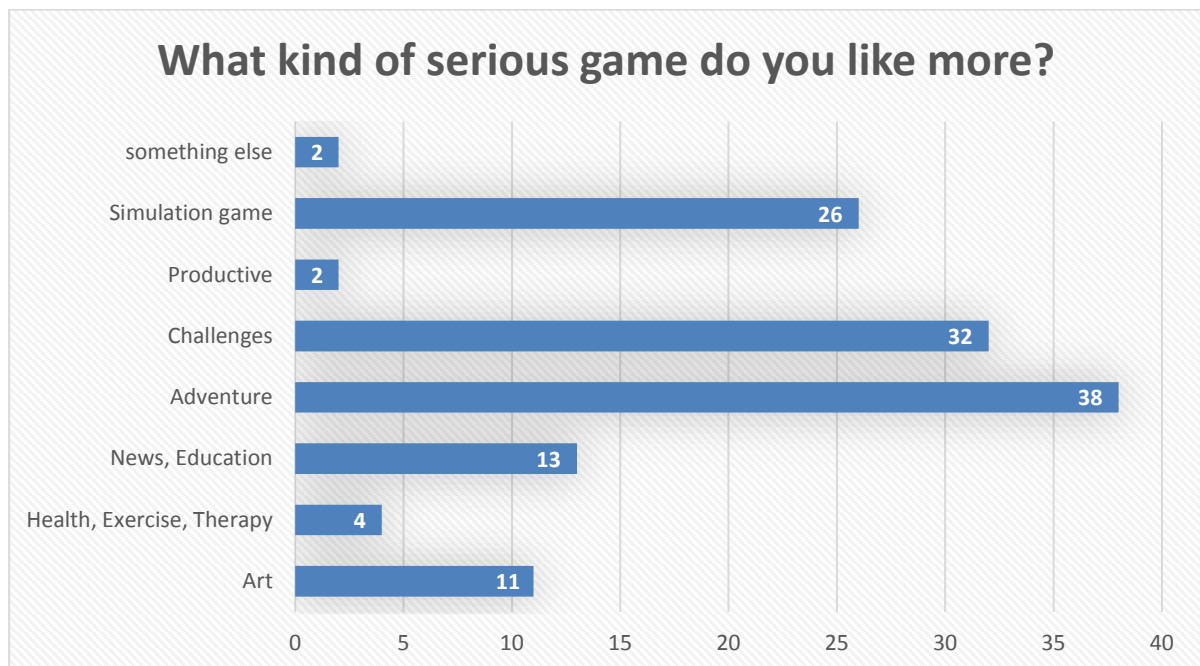
Figure 36: What kind of serious game do you like more?

Motivation was identified as key challenge by the students; therefore, it is of interest to know what they find motivating in playing games. Figure 37 shows a mixed response 58% feel motivated by the storyline, for fun and competitiveness in a game also keeps them motivated to play a game.

What keeps you motivated to carry on playing a game?

Category	Value
No information / I don't know	8
Storyline	14
Will to win	5
To become a pro	8
Multiplayer	1
For fun	6
Graphics	1
Interest	4
Competitiveness	12
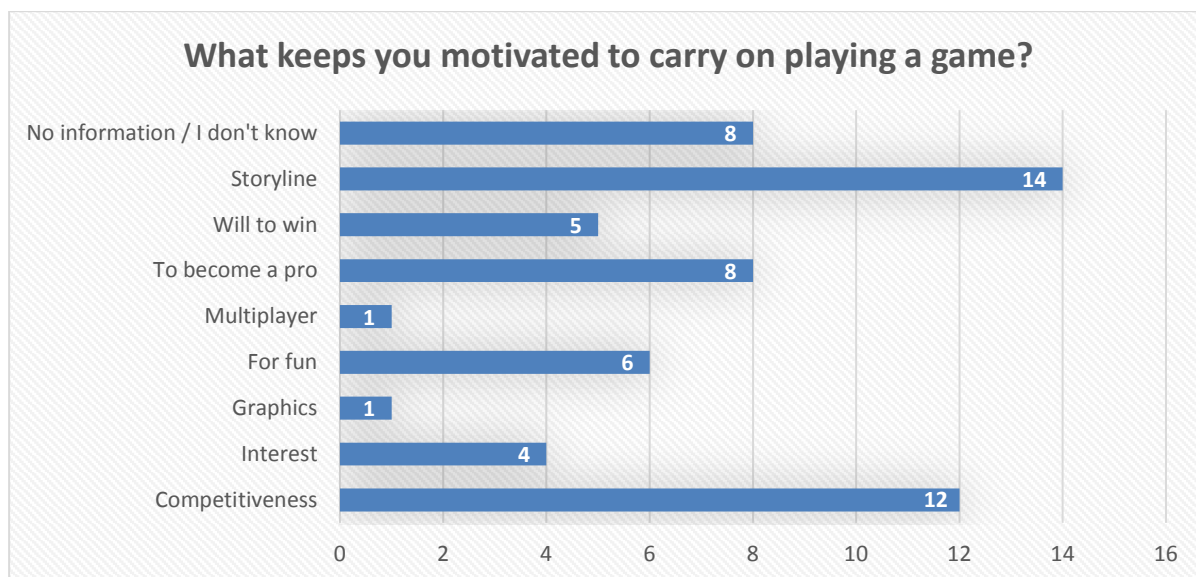
Figure 37: What keeps you motivated to carry on playing a game?

Regarding the platforms, the students' most preferred platform is computer (46) followed by consoles (20), tablets (18) and mobile phones (19). The students were also asked about the value they see in playing. Even though 18 mentioned improved skills, concentration and logical thinking, almost the same share (17) saw the value only as fun and relaxing, the most students (21) did not know. However, explicitly asked about their opinion on the value of educational games, 28 answer that these can be at help for learning. Nevertheless, in order to ensure a good perception and a high take up, it will be necessary to explain the pedagogical value of the Beaconing gaming part.

3.5.3   External outcome

Two hundred and twenty external students have so far responded either via questionnaire or online (students aged over 18 only). As for the internal group, the main challenge the students are facing is low motivation (112), followed by a lack of computer at home (61) and face to face interaction (38), 9 had others, but not described in more details.

Figure 38 indicates that the students prefer different means for learning STEM, but that active, experiential methods as well as the use of computer are most appreciated.

What are your preferred ways of learning STEM?

Category	Value
Internet	20
Face to face interaction	26
Games	27
Experiments	25
Problem solving	22
Computer	34
Technology	19
Practicing	30
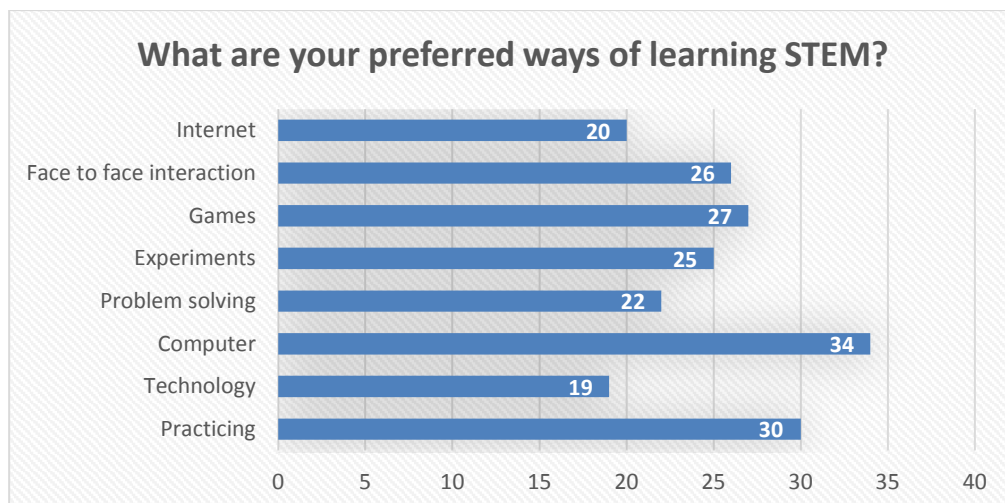
Figure 38: What are your preferred ways of learning STEM?

As for the internal students, chats (163) is the preferred communication means followed by audio/video calls (99) and 35 indicate media share. The communication channel favoured by school administrations, forum, get the lowest response (21)

In Figure 39 the students are asked for their expectations on Beaconing guidance and support. The results differ from the internal group, since tutorial is the most common answer here.

What kind of guidance/support materials do you expect from Beaconing?

Category	Value
something else	7
Tutorials	139
Digitized lessons	69
Hard copy materials	29
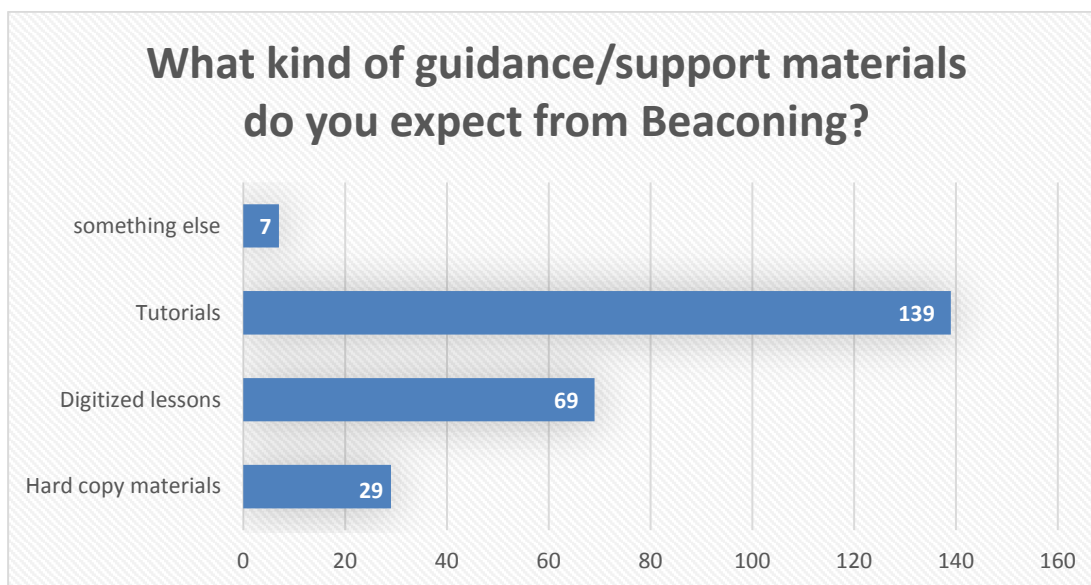
Figure 39: What kind of guidance/support materials do you expect from Beaconing?

94 % of the students play games (the most popular games are Counter Strike, GTA, FIFA and League of Legend) and 70 % have played educational games. The most popular games 185 students answer that anonymity and digital identity are important or very important. This is a much higher share than in the internal group. Only around 48% of the students have access to LMS, which is much lower than in the internal group, but around 25% have access to educational games (Figure 40)
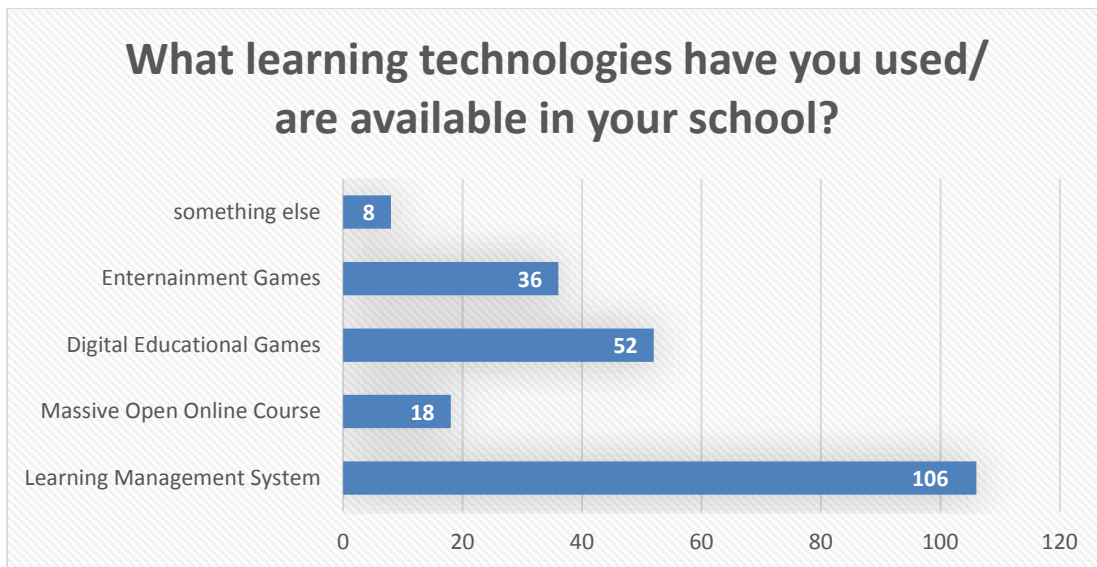
Figure 40: What learning technologies have you used/ are available in your school?

Figure 41 indicates that the majority (60%) prefers Adventurous and Challenging type of serious games followed by Simulation (multiple answers allowed)
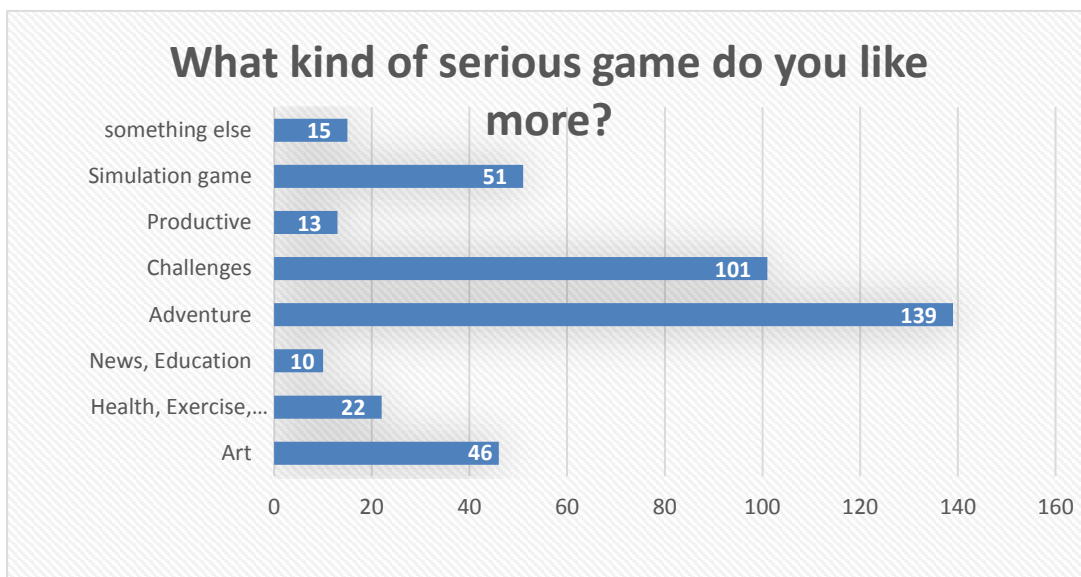
Figure 41: What kind of serious game do you like more?

Figure 42 shows that, there is no clear trend related to motivation, a considerable share (26%) find storyline and fun in a game as the most motivating factor for playing a game.

What keeps you motivated to carry on playing a game?

Category	Value
No information / I don't know	48
Plot	6
Storyline	33
Will to win	19
To become a pro	18
Multiplayer	11
For fun	20
Graphics	11
Interest	17
Competitiveness	19
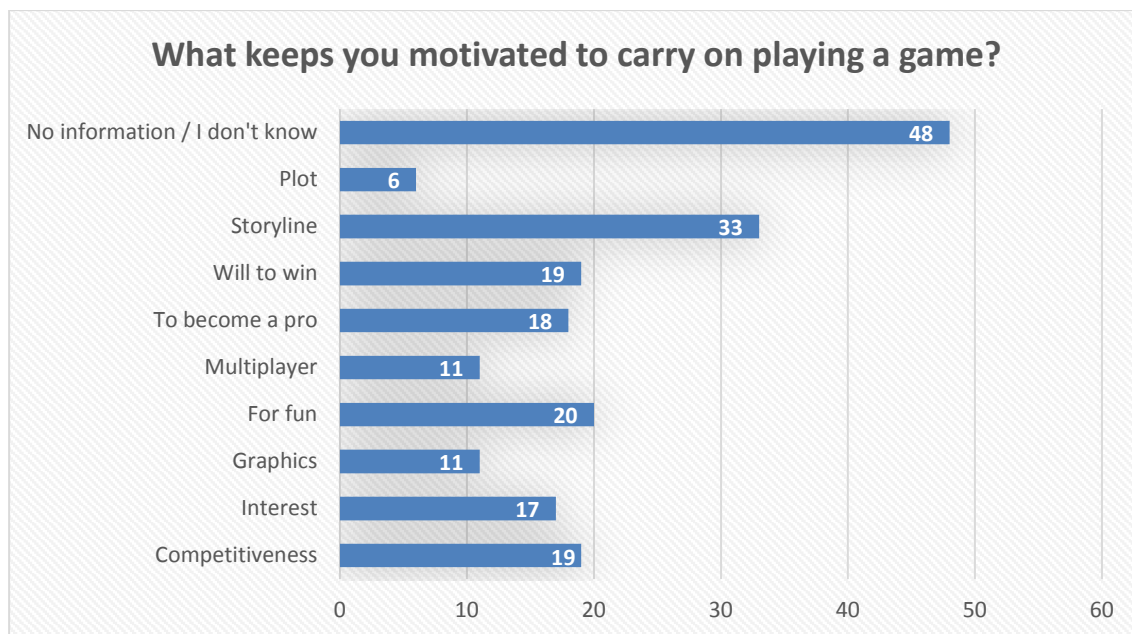
Figure 42: What keeps you motivated to carry on playing a game?

As in the internal group, the most popular platform is PC (85). However, as seen in Figure 43, the second most popular are mobile phones and not consoles like in the internal group.

What are your preferred platforms to play games?

Category	Value
something else	15
Consoles	57
Mobile phones	75
Tablet	31
Computer	85

Figure 43: What are your preferred platforms to play games?

The value of playing games is more differentiated than for the internal group (Figure 44), but still a high proportion does either not see any value or does not know. However, also aspects like team work and learning new skills are mentioned.
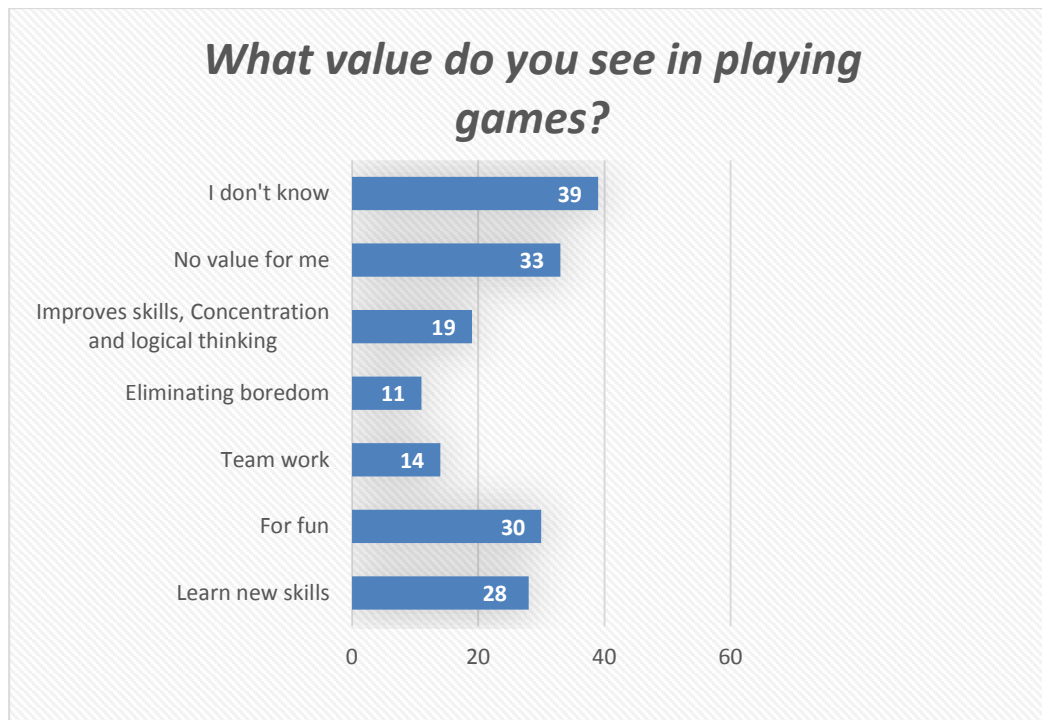
Figure 44: What value do you see in playing games?

3.5.4   Comparison

This section compares the internal and external responses for one of our two main user groups- the students. 220 external and 65 internal students participated. The comparison and the trends followed by these students are as follows:

It starts with the results of the first question of the survey. The outcomes of both internal and external show that the maximum students are in the age group of 15-17, but the outcomes differentiate in a way that in the internal part, there are less number of students with an age group of 17 or above than the external part. This part of percentage has gone to the age of 15 years old in the internal part i.e. it has increased from 34% to 49%. Around 2/3 of the participants were males and 1/3 of them were females.
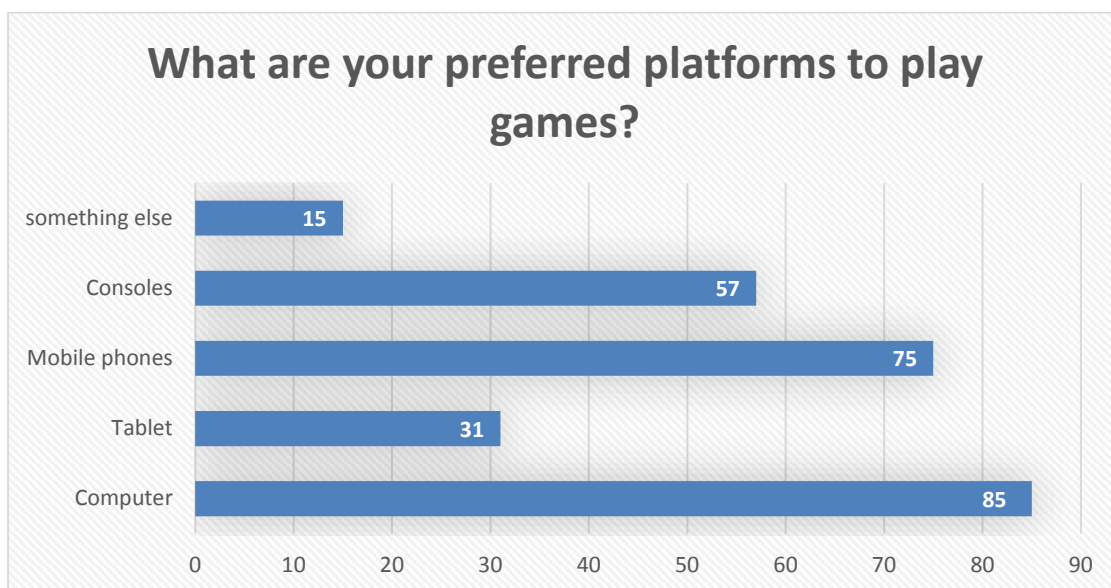
Motivation is the main challenge faced in day-to-day learning activities (51% and 54% in external and Internal questionnaires respectively). Interesting for the Beaconing Project is also the lack of access to the computer at home, which was 17% for internal and 28% for external

In the case of 'Preferred ways of learning STEM', it was almost a similar reply at both sides except that, in case of external participants, experiments (12% vs. 4%) were more popular and Problem solving (11% vs. 21%), practicing (15% vs. 23%) were less popular as compared to the internal group results.

Concerning the 'Name of Communication and collaboration features used while being online', it was a similar response at both ends and 'Chat' led the charts with a 51% and 58% in external and internal sections respectively.

While analysing responses on 'kind of guidance/support material expected from Beaconing', there are many noticeable changes i.e. the chart leader in internals named 'Tutorials' went from 57% to 47% in external section and 'Digitised lessons' went from 28% to 48%.

On 'Learning technologies used/available in school', most of the students at both ends replied for LMS i.e. 48% and 43% in external and internal sections respectively. The major changes were seen in 'Entertainment games' (16% vs. 9%) and 'Something else' (4% vs. 18%) in external and internal sections respectively.

Concerning 'Playing games in general', it was a clear response i.e. 94% of the externals and 89% of the internals voted in favour of a yes.

In the case of 'ever played a game designed for learning purpose', both of the participants voted mostly for a 'Yes' but still (12% vs. 29%) and (18% vs. 11%) voted in favour of a 'No and I don't know' in external and internal charts respectively.

While analyzing the answers for 'Kind of serious games liked', it was very clear that Adventure, Challenging and simulation games are very famous among both groups, while Adventure secured first place with 35% and 30% popularity among external and internal participants respectively.

In the case of 'Motivation to carry on playing a game' storyline, for fun and competitiveness were popular among both groups, while for fun lead the charts with 24% in external section and Storyline stood most famous among the internals with 24% votes.

In response to 'Preferred platforms to play games', maximum votes went to Computer i.e. 32% by externals and 47% by internals, but this is also a noticeable point that mobile phones are two times more popular among the externals(28%) than the internals(14%).

When asked about 'what value do you see in playing games?' it was sad to see that 42% voted in favour of 'I don't know/No value for me' in external section and 39% voted for it in internal section. But still 'For fun and Improves Skills/Concentration/logical thinking' were second most popular among the External and internal participants with 17% and 32% votes respectively.

A major concern is related to the low added value the students see in playing educational games, since most chosen options were 'I don't know' i.e. 29% and 43% among external and internal participants respectively. While the second most voted option among externals was 'Interesting' with 21%, among internals it was 'Help in learning' with 40%, which was third most popular among externals with 20% votes.

4   CONCLUSION

This deliverable presents the needs and the expectations the different stakeholder groups (parents, teachers, students, schools and technology and content providers) have. More than 800 popular have so far responded, but we are still collecting answers from the pilots (as the pilot classes are selected and involved in the co-creative process). The results so far indicate that it is not only a matter of the technical solution, but the uptake and user engagement will also heavily depend on our ability to inform about the possibilities as well as to increase the awareness. Tutorials will be a main key to the success, and also the usage of mock-ups for our first prototypes will help in order to improve the awareness.

Looking at some interesting differences for Beaconing shows that the main learning technologies used by the teachers include traditional techniques, Learning Management Systems (LMS), and digital education games, and also the internal students have corresponding access to LMS, but only 48% of the external. Furthermore, all groups require an easy access and a user friendly interface. Early test with the different user groups will therefore be necessary, in order to incorporate their feedback at an early stage of the design. In addition, imperative is the availability of assessment, feedback and evaluation tools including, intuitive and fast analytics for tests and reports on learners. Concerning the motivating mechanisms, immediate feedback on multiple levels, user friendly interfaces and feedback on achievements should be supported. Almost all teachers like to get supported with digitised lessons and tutorials by the beaconing project, which is in line with the expectation of the students, but not so many teachers intend to develop digitised lessons themselves. This might be due to the expected considerable amount of work. An authoring tool that reduces the working load and support fast adaptions is therefore of utmost importance combined with easy to change plots and storylines. The communication features forums, chats, and media sharing are considered as most important, but have big differences across the user groups.

A major issue in Beaconing is the adaption to students and teachers with special needs. So far, the respondents have identified that learning, memory, and thinking disabilities play a major role for disabled students in regard of the usage of IT, and therefore, dyslexia and learning disabilities need to be supported, but also sight and hearing impairment and autism should be supported according to the parents and the external teachers need. A major issue is however not only the technology but the lack of trained teachers.

A majority of teachers explains that pen and paper based tests are the main means of assessment followed by formative and summative assessments and online tests, but also oral presentations are used. After project based learning, games (quiz), group work, interactive classes, discovery and study are considered as the main activities students do enjoy.

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6 ANNEX

6.1 PARENTS QUESTIONNAIRE

The following questions were asked to a selected group of Parents:

1. Are educational games helpful for children?
2. Do you study with your kids?
3. How do you help your children in Study?
4. Do you feel competent to help your children?
5. How often you check the progress?
6. Which learning information you want to know about your children?
7. Would you engage yourself in location based educational games?
8. Would you give permission of a location based game to your children?
9. Would you prepare to pay for location based educational games? How useful IT school is?
10. What disabilities should beaconing provide support for?
11. What security issues you expect from these games?
12. What engaging/motivating mechanisms would you like to have?
13. What kind of guidance/support materials you expect from Beaconing?
14. Which communication and collaboration features do you like to use in particularly when being online?
15. What is the Importance of Ethics in Location based applications?
16. In your opinion, how should the platform integrate digital ethic concerns?

6.2 TEACHERS QUESTIONNAIRE

The following questions were asked to a selected group of teachers:

17. What learning technologies have you used/are available in your school?
18. Do you wish to integrate the features of Beaconing in your current Learning Management System?
19. What open source technologies do you use, if any?
20. Is Wi-Fi available in your school?
21. Which internet browser do you use at your school?
22. How good is the network coverage inside your school?
23. What features and reporting capabilities should a learning platform have?
24. What engaging/motivating mechanisms would you like to have?
25. What kind of guidance/support materials do you expect from Beaconing?
26. Which communication and collaboration features do you like to use in particularly when being online?
27. What social networks do you prefer?
28. How important are ethics in location-based applications?
29. In your opinion, how should the platform integrate digital ethic concerns?
30. What needs/restrictions do you find important?
31. What are the local age-related regulations, if there are any?
32. In your opinion, how useful is IT in school?
33. What are the main issues related to disabled students and the use of IT in school?
34. Which disabilities should BEACONING provide support for?
35. What could be the main security issue?
36. What are the main doubts you have when using a new technological platform?
37. Is your city a smart city (A city where information and communication technology solutions are implemented by integrating sensors with real time monitoring systems)?

38. If you could use lessons from Beaconing, would you prefer to?
39. When using technological platforms, which do you prefer?
40. Do you have a mandatory competence(s) / curriculum to teach?
41. Do you have any complementary competence / curriculum to teach?
42. What subject do you teach?
43. Which kind of assessment activities / means do you use?
44. What activities do you think your students enjoy most?
45. How much time do you spend preparing content for your classes?
46. Which tools do you use to prepare content for your classes?
47. Are you willing to share your content?
48. Are you willing to use content from others?
49. Have you used a language, other than your primary teaching language for preparation of content?
50. How do you prepare the content for students with special needs?
51. As a teacher, do you have any special needs that we need to take into account in order to design the Beaconing platform in the most optimised way for you?
52. Do you like serious games?
53. What kind of serious games have you played?

6.3 QUESTIONNAIRES SCHOOLS

The following questions were asked to a selected group of Schools:

1. What learning technologies have you used / are available in your school?
2. Do you wish to integrate the features of Beaconing into your current Learning Management System?
3. Which hardware / devices are available at your school?
4. Which are the technological platforms you are using at your school?
5. Are the learning technologies you use licensed?
6. What open source technologies do you use?
7. Is Wi-Fi available?
8. Which internet browser do you use at your school?
9. How good is the network coverage inside your school?
10. How are the costs for internet connection managed?
11. Can the school accommodate the construction of pervasive environments (Intelligent and context aware environment with wireless sensor technology)?
12. What features and reporting capabilities should a learning platform have?
13. What kind of guidance / support materials do you expect from Beaconing?
14. Which communication and collaboration features do you particularly like to use when being online?
15. What social networks do you prefer?
16. How important are ethics in location-based applications?
17. In your opinion, how should the platform integrate digital ethic concerns?
18. What needs / restrictions do you find important?
19. Which are the local age-related regulations, if there are any?
20. Where can the data be stored?
21. In your opinion, how useful is IT in schools?
22. What are the main issues related to disabled students and the use of IT in school?
23. What disabilities should Beaconing provide support for?
24. What could be the main security issues?
25. What are the main doubts you face while using a new technological platform?

26. Is your city a smart city (A city where information and communication technology solutions are implemented by integrating sensors with real time monitoring systems)?
27. When using technological platforms, which do you prefer?

6.4 COMPANY QUESTIONNAIRE

The following questions were asked to a selected group of Companies:

1. What kind of business model you detect on location-based games?
2. What kind of business model you detect on location-based educational games?
3. Can we have access to your geospatial/location based data?
4. Is your city a smart city (A city where information and communication technology solutions are implemented by integrating sensors with real time monitoring systems)?

6.5 STUDENT QUESTIONNAIRE

The following questions were asked to a selected group of Students:

1. What is your age?
2. What is your Gender?
3. Do you have access to a computer or tablet at home?
4. Do you have access to the internet at home?
5. Do you own a mobile phone?
6. Does your mobile phone have internet connectivity?
7. Does your mobile phone have Global Positioning System (GPS)?
8. What kind of challenges do you face in your day-to-day learning activities (at school, home and beyond)?
9. What do you like in STEM (Science, Technology, Engineering and Mathematics) subjects?
10. What do you not like in STEM (Science, Technology, Engineering and Mathematics) subjects?
11. What are your preferred ways of learning STEM?
12. Why do you like getting on the internet (e.g. on social network sites)?
13. Name you top three activities for which you use electronic gadgets connected to internet (i.e. mobile phone, tablet and computer)?
14. Name your three top social network sites?
15. In a typical week, in which social network sites do you spend at least 30 minutes during a day?
16. Which communication and collaboration features do you particularly like using when being online?
17. What kind of guidance/support do you expect from Beaconing?
18. How important is a device with internet connectivity for you?
19. How important are the notions of anonymity and digital identity for you on internet?
20. What learning technologies have you used/ are available in your school?
21. In your view, how important is IT in schools?
22. IS Wi-Fi in your school accessible to you outside the class room?
23. Do you play games in general (e.g. electronic, video, board-games and sports)?
24. Do you play digital games (e.g. on mobile phones, consoles, computers)?
25. In a typical week, about how many days do you spend at least 30 minutes playing a digital game?
26. Have you ever played a game that was specifically designed with a learning purpose (i.e. learning game, serious game)?
27. Name your three top games of all time.
28. Which games have you played in the last three months and enjoyed a lot?
29. What kind of serious game do you like a lot?
30. What keeps you motivated to carry on playing a game?

31. What are your preferred platforms to play games?
32. What value do you see in playing games?
33. What your views are regarding games that are specifically designed with a learning purpose?