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Testing of the prototype in schools and in dual vocational training systems

Authors:

Maja Dragan
Hagen Helge Hochrinner
Aleksandra Cupac
Mercedes Ruiz Carreira
Elena Orta Cuevas

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1.

INTRODUCTION

This document describes the final analysis of the trial results carried out by all partners (**Spain** - University of Cadiz, **Austria** - FH Joanneum University of Applied Sciences, **Finland** – LAUREA University of Applied Sciences, **Lithuania** – Klaipeda University, **Slovenia**- ACADEMIA and **Italy** – Link Campus University) during the evaluation process of the Dig4Life serious game in schools and higher education institutions. The data have been collected and analysed following the steps of the empirical research protocol defined in the *IO3.A1.1 Research Protocol for Testing Dig4Life in Schools* document.

The content of the rest of the document is as follows. Section 2 includes a description of the evaluation procedure and the factors considered to assess the quality of the game and the feasibility of the game for assessing digital skills. The following section contains an analysis of data on gaming experiences conducted by all partners. Section 4 includes an analysis of the game's strengths, weaknesses and suggestions for game improvement made by participants involved in the experiences. Finally, section 5 includes conclusions about the relevance of the game for the assessment of students' digital competences.

1.1

procedure description

The purpose of the evaluation procedure of the Dig4Life serious game is to analyse from the perspectives of the students and the teachers involved in the game experiences conducted, the player experience and the perceived usability with a primary focus on the game feasibility to self-assess digital competences. The data have been collected in an automatic way using two evaluation questionnaires, one for students and one for teachers, administered both with the Survey Monkey software tool. The objective of the student's questionnaire is to evaluate the student's experience using the game and the objective of the teacher's questionnaire is to obtain the teacher's perception of the student's participation as well as the teacher's opinion about the experience. These questionnaires are explained in the *IO3.A1.1 Research Protocol for Testing Dig4Life in Schools* document.

The evaluation procedure conducted by the project partners can be summarised as follows:

- The tutor of the game experience explained to the teachers the objective of the evaluation questionnaires and the blocks in which the questions were grouped. They stressed that most of the questions had to be

answered on a Likert scale from five possible answers (strongly agree, agree, neither agree nor disagree, disagree or strongly disagree).

- Once the gaming experience in class was over, the teachers asked students to answer the questionnaire and explained how to do it highlighting the importance of completing all the questions for a proper assessment of the serious game. The links to the questionnaires were included in the courses created in the virtual platform to conduct the game experiences.
- The work team evaluated and interpreted the questionnaire data collected in the Survey Monkey platform. After analysing the data and graphs exported from Survey Monkey, they concluded the opinion of the teachers and the students about the usability and game experience of the Dig4Life serious game as a tool for self-assessing students' digital competences.

1.2

Q

uality factors

As we said before, the evaluation of the Dig4Life serious game has been conducted in terms of usability and player experience quality factors. Next, we explain these two quality factors, and the dimensions and items selected to assess them.

2.1.1

Player experience

The player experience covers the interaction of the students and the teachers with the Dig4Life serious game. The dimensions of this quality factor are as follows:

- *Challenge*: this dimension evaluates if the game is sufficiently challenging with respect to the student's competence level.
- *Satisfaction*: this dimension assesses if students feel that their effort results in digital competences learning.
- *Focused attention*: this dimension evaluates the attention, focused concentration, absorption and temporal dissociation of the students.
- *Fun*: this dimension evaluates the students' feeling of pleasure, happiness, relax and distraction.
- *Relevance*: this dimension evaluates if the game contents are consistent to the students' interests, and the game is an adequate tool to evaluate digital competences and allow students to set learning goals.

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[Table 1](#) contains the dimensions and items of the player experience quality factor.

Table 1: Dimensions and items of the game quality factor “Player experience”

Dimension	Participant	Item
Challenge	Student	<ul style="list-style-type: none"> ■ The game is appropriately challenging for me. ■ The game provides new challenges at an appropriate pace. ■ The game does not become monotonous as it progresses.
	Teacher	<ul style="list-style-type: none"> ■ I felt the game was appropriately challenging for the students. ■ The game provides new challenges to the students at an appropriate pace. ■ The game does not become monotonous as it progresses.
Satisfaction	Student	<ul style="list-style-type: none"> ■ Completing the game tasks gave me a satisfying feeling of accomplishment. ■ It is due to my effort that I managed to advance in the game. ■ I feel satisfied with what I became aware of from playing the game. ■ I would recommend the game to my friends.
	Teacher	<ul style="list-style-type: none"> ■ I noticed that by completing the game tasks the students had a feeling of accomplishment. ■ I noticed that it is due to the students' effort that they managed to advance in the game. ■ I feel satisfied with what the students became aware of from playing the game. ■ I would recommend other teachers to use this game in their courses.
Focused attention	Student	<ul style="list-style-type: none"> ■ There was something interesting at the beginning of the game that captured my attention. ■ I was so involved in my gaming task that I lost track of time.

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		<ul style="list-style-type: none"> I forgot about my immediate surroundings while playing the game.
	Teacher	<ul style="list-style-type: none"> There was something interesting at the beginning of the game that captured the students' attention. The students were so involved in the gaming task that they lost track of time. I felt that the students forgot about their immediate surroundings while playing the game.
Fun	Student	<ul style="list-style-type: none"> I had fun with the game. Something happened during the game which made me smile.
	Teacher	<ul style="list-style-type: none"> The students had fun with the game. Something happened during the game which made the students smile. I would like to use the game again in my courses.
Relevance	Student	<ul style="list-style-type: none"> The game contents are relevant to my interests. The game is an adequate tool to become aware of my level of digital competence. I prefer using the game to find out about my level of digital competence than using other ways. The game allowed me to set learning goals to improve my digital competence.
	Teacher	<ul style="list-style-type: none"> The game contents are relevant to the students' interests. It is clear to me how the contents of the game are related to the different digital competences. The game is an adequate method for assessing the student's digital competence. I prefer using the game to assess the student's digital competence than other ways. The game allowed me to set learning goals to improve my students' digital competence.

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2.1.2

Usability

Usability can be defined as the degree to which the Dig4Life serious game can be used by students to achieve specific goals with effectiveness and efficiency in digital competence evaluation. The dimensions of this quality factor are as follows:

- *Aesthetics*: this dimension evaluates if the game interface enables users to interact pleasantly and satisfactorily.
- *Operability*: this dimension assesses whether the game is easy to play and the game rules are clear.
- *Learnability*: This dimension evaluates if the game can be used to achieve specific learning goals with effectiveness, efficiency, risk free and satisfaction.
- *Accessibility*: This dimension evaluates if the fonts used in the game are easy to read, the voices easy to understand, the colours and sounds meaningful and the speech speed adequate.

The usability quality factor includes the dimensions and items shown in [Table 2](#).

Table 2: Dimensions and items of the game quality factor “Usability”

Dimension	Participant	Item
Aesthetics	Student	<ul style="list-style-type: none"> ■ The game design is attractive. ■ The text font and colours are well blended and consistent.
	Teacher	<ul style="list-style-type: none"> ■ The game design is attractive. ■ The text font and colours are well blended and consistent
Operability	Student	<ul style="list-style-type: none"> ■ I think that the game is easy to play. ■ The game rules are clear and easy to understand.
	Teacher	<ul style="list-style-type: none"> ■ Explaining the rules of the game was easy for me. ■ The game rules are clear and easy to understand.. ■ It was easy to use the game in my course. ■ I think that the game is easy to play.

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Learnability	Student	<ul style="list-style-type: none"> ■ I needed to learn a few things before I could play the game. ■ Learning to play the game was easy for me. ■ I think that most people would learn to play the game very quickly.
	Teacher	<ul style="list-style-type: none"> ■ I needed to learn a few things to understand the game. ■ Learning to play the game was easy for me. ■ I think that most of the students would learn to play the game very quickly.
Accessibility	Student	<ul style="list-style-type: none"> ■ The fonts used in the game are easy to read. ■ The colours used in the game are meaningful. ■ The sounds used in the game are meaningful. ■ The voices used in the game are easy to understand. ■ I found that the speed of the speech was adequate to follow the game.
	Teacher	<ul style="list-style-type: none"> ■ The fonts used in the game are easy to read ■ The colours used in the game are meaningful. ■ The sounds used in the game are meaningful. ■ The voices used in the game are easy to understand. ■ I found that the speed of the dialogues was adequate to follow the game.

The following chapters describe the results of the Dig4Life serious game evaluation conducted by the project partners plus a global section that provides an overall analysis at the project level. Each chapter contains graphs that represent the quantitative data collected through the evaluation questionnaires answered by the students and the teachers involved in the game experiences that each partner has carried out. These data can be categorized in demographic data and quality factors data (see [Table 1](#) and [2](#), respectively).

In order to simplify the results and draw meaningful conclusions, two overall measures of agreement and disagreement of the participants with each statement have been calculated. To obtain the overall measure of agreement, the answers rated as “agree” and “strongly agree” have been combined into one single category, by adding the number of answers rated as such. The same has been done for the answers rated as “disagree” and “strongly disagree” to obtain an overall measure of disagreement with each statement.

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For each quality factor, a collection of figures showing the quantitative results obtained on each dimension of such factor and an interpretation of such results are included, followed by a final discussion of the assessment of each quality factor. Next, the qualitative data provided by the participants to the open-ended questions in the questionnaires regarding the game strengths, weaknesses, and suggestions for improvement is included. The last section summarises the conclusions obtained regarding the project's objectives compliance.

2.

A

ANALYSIS OF RESULTS

This section includes the data analysis of the game experiences conducted by the **Spain** - University of Cadiz, **Austria** - FH Joanneum University of Applied Sciences, **Finland** - LAUREA University of Applied Sciences, **Lithuania** - Klaipeda University, **Slovenia** - ACADEMIA and **Italy** - Link Campus University. The total number of participants was 494 students and 99 teachers. According to student evaluation partition, the first place with the highest number of participants is Spain with 35.22% of students, followed by Italy with 17.61%, then Austria 12.55%, Slovenia with 12.35%, Lithuania 11.74% and Finland with 10.53%. Regarding teacher evaluation, Italy is in the first place with 23.23%, followed by Slovenia 20.20%, then Austria and Spain with 16.16% and Finland and Lithuania 12.12%. The results of the analysis of the evaluation questionnaire, which were completed by all teachers and students, will be analysed in the following sections.

2.1

Demographic data

The common demographic data collected in the student and teacher evaluation questionnaires consist of three different items:

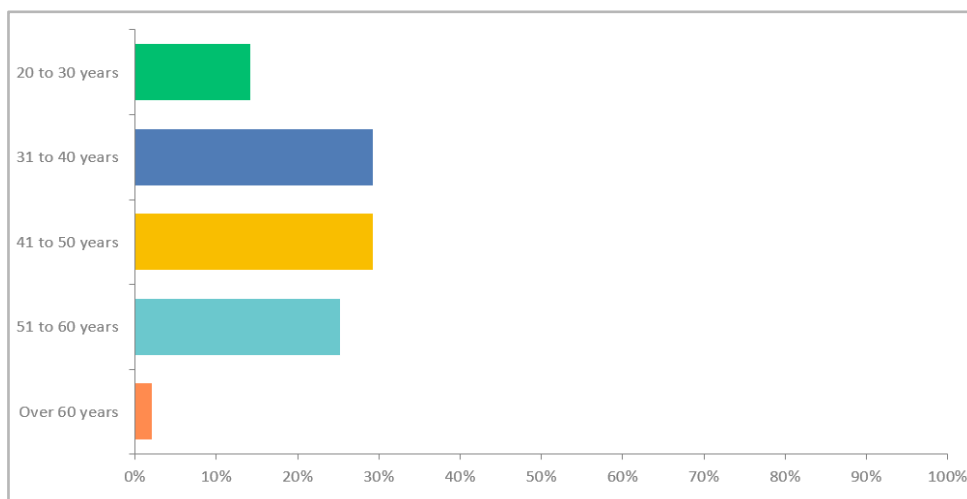
- Country, which for this partner are **Finland, Italy, Lithuania, Slovenia, Spain and Austria**.
- Age group, to which the participant belongs.
- Gender identity, which is the participant's own internal sense of gender.

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■ Teacher demographic data analysis:

[Figure 1](#) shows the data of teachers' age group while [Figure 2](#) shows the data of teachers' gender identity.

Figure 1: Age group of the teachers

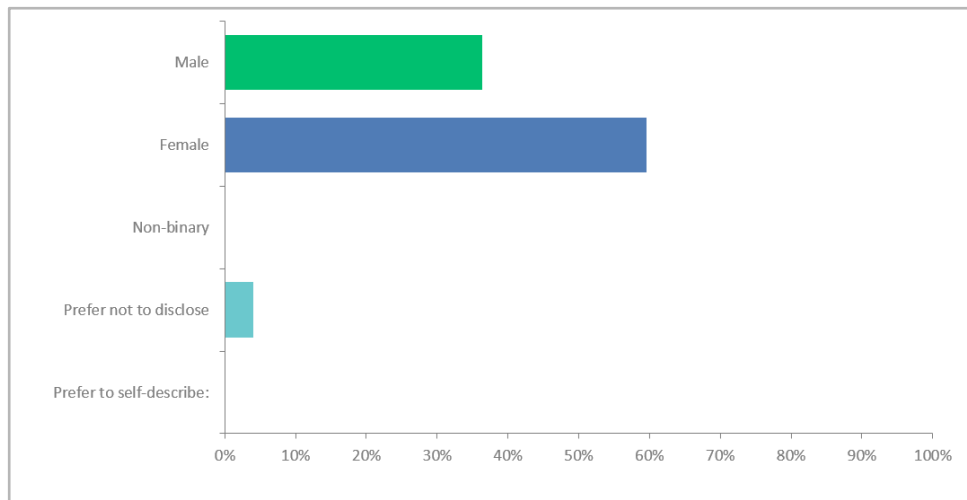


Source: [Dig4Life Questionnaire for teachers]

[Figure 1](#) shows that 14.14% of teachers involved in game experiences are in the age range of 20 to 30, 29.29% in the range 31 to 40 years and 41 to 50 years, then 25.25% in age 51 to 60 years. Other teachers (2.02%) are over 60 years old.

Figure 2: Gender identity of the teachers

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Source: [Dig4Life Questionnaire for teachers]

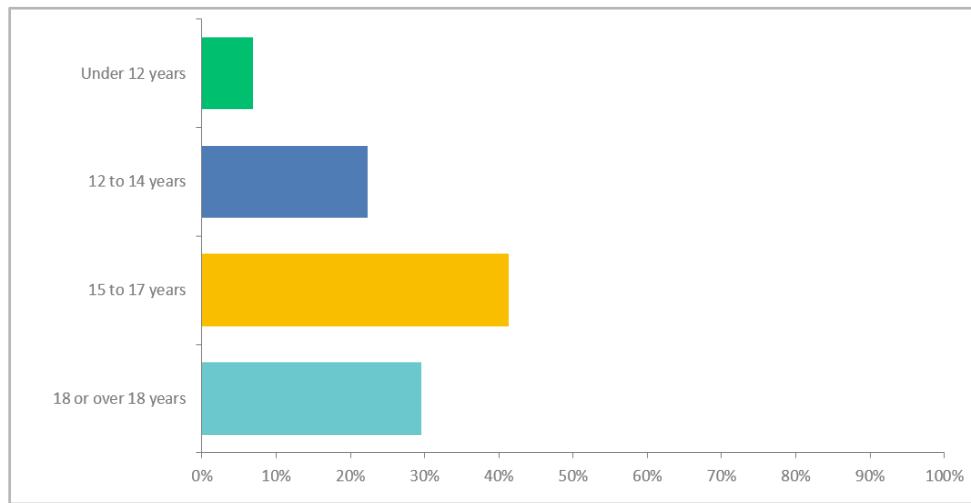
Figure 2 shows that the percentage of male teachers who have participated in the game experiences is 36.36%, this percentage is 23.24% lower than the percentage of female teachers (56.60%) and 4.04% of the teachers prefer not to disclose.

■ Student demographic data analysis:

Figures 3 and 4 respectively show the data related to the age group and gender identity of the students.

Figure 3: Age group of the students

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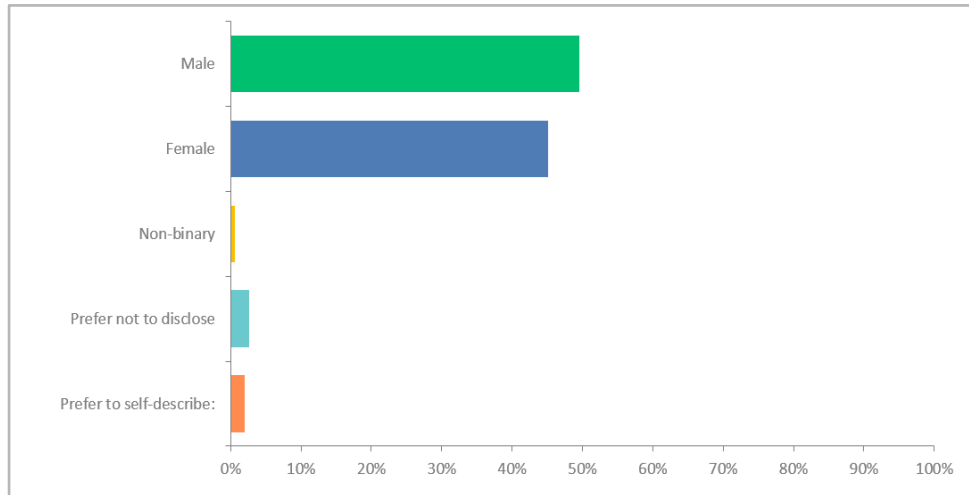
Source: [Dig4Life Questionnaire for students]

The data analysis of Figure 3 indicates that 41.30% of the students involved in the game experiences are in the age range of 15 to 17 years. Besides, only 6.88% are under 12 years and 29.55% are in the range of 18 or over 18 years and the rest with 22.27% are in the range of 12 to 14 years old.

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Figure 4: Gender identity of the students



Source: [Dig4Life Questionnaire for students]

Figure 4 shows the data regarding the students' gender identity. It is observed that the percentage of male students and female students involved in the game experiences is very similar and around 50% each (49.60% male and 45.14% female). Non-binary with 0.61%, then 2.63% prefer not to disclose and 2.02% prefer to self-describe.

2.2

Q

Quality factor: Player experience

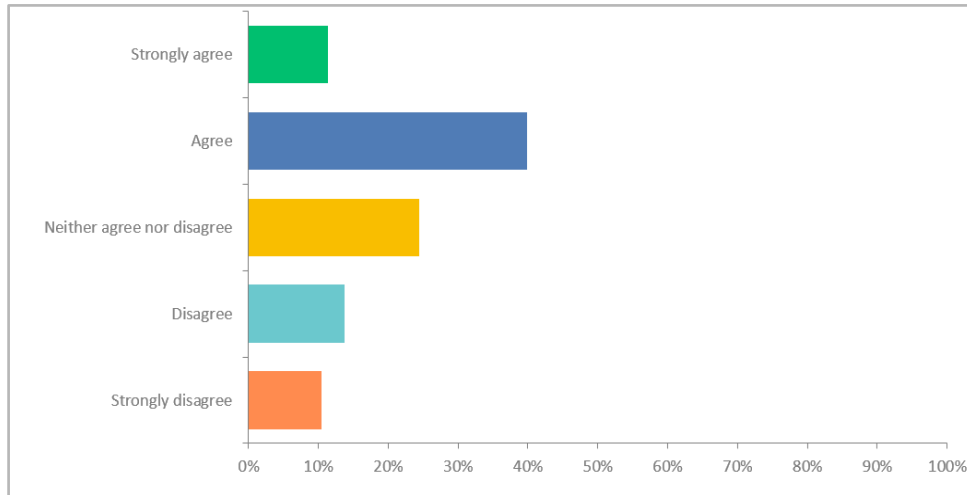
This section includes the data analysis of the items of the player experience quality factor (see [Table 1](#)) collected in the game experiences carried out.

- **Challenge**
- Student evaluation analysis:

This section contains the analysis of the students' opinion about the different items considered in this study to measure how challenging the game is.

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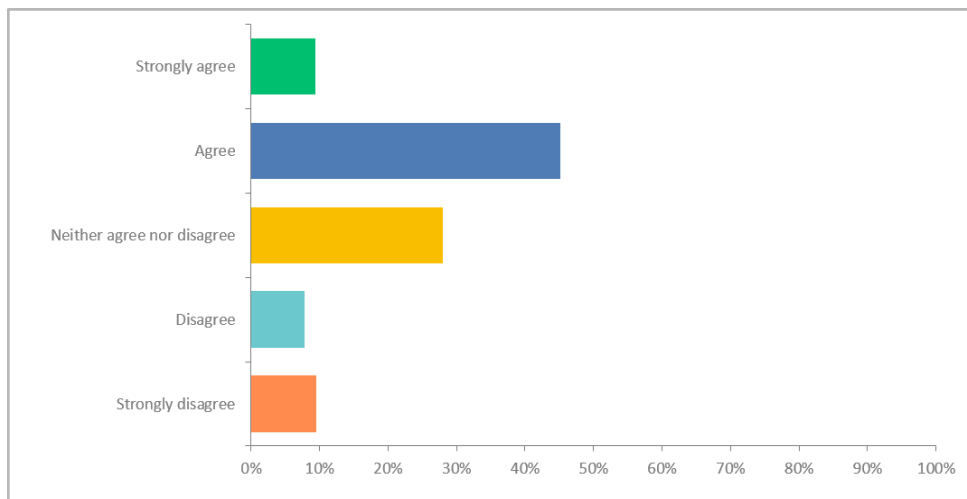
Figure 5: The game is appropriately challenging for me



Source: [Dig4Life Questionnaire for students]

The analysis of the data represented in [Figure 5](#) indicates that 51.23% of the students think that the game is appropriately challenging while 24.28% disagree (26.95% less than the percentage of students who agree).

Figure 6: The game provides new challenges at an appropriate pace

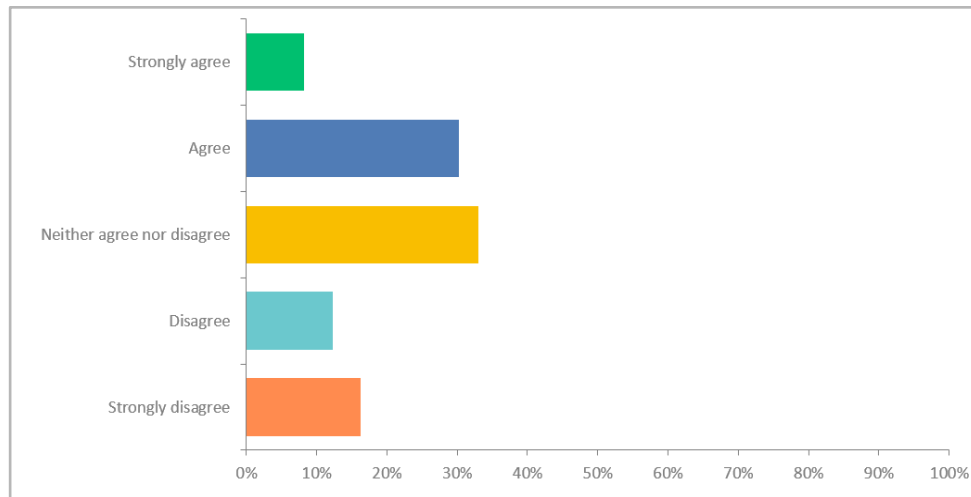


Source: [Dig4Life Questionnaire for students]

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Figure 6 shows that 54.56% of the students consider that the game provides new challenges at an adequate pace while only 17.38% disagree (37.18% less than the percentage of students who agree).

Figure 7: The game does not become monotonous as it progresses



Source: [Dig4Life Questionnaire for students]

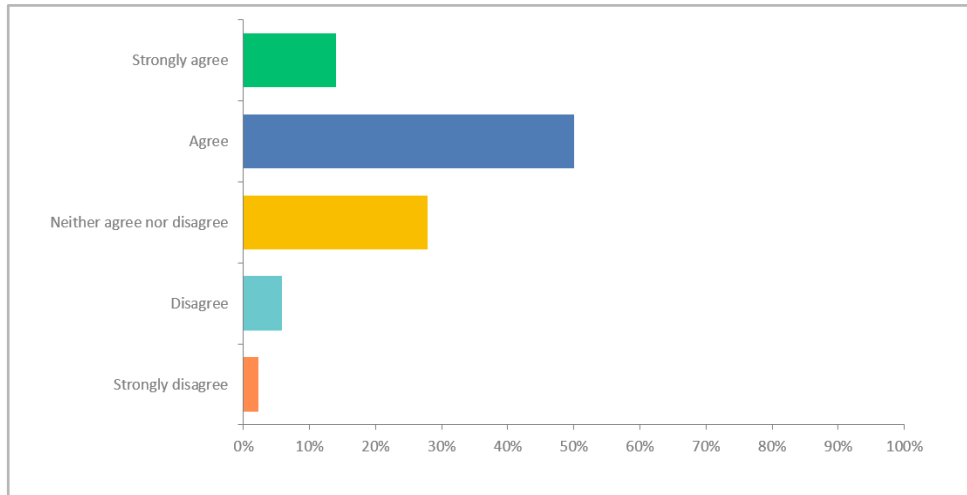
Figure 7 shows that 38.53% of the students consider the game doesn't become monotonous as it progresses while 28.51% disagree (10.02% less than the percentage of students who agree). The rest of the students (32.96%) neither agree nor disagree.

■ Teacher evaluation analysis:

This section contains the analysis of the teachers' perception about the items selected to evaluate the game challenge: a) the game is appropriately challenging for the students, b) the game provides new challenges to the students at an appropriate pace and c) the game does not become monotonous as it progresses.

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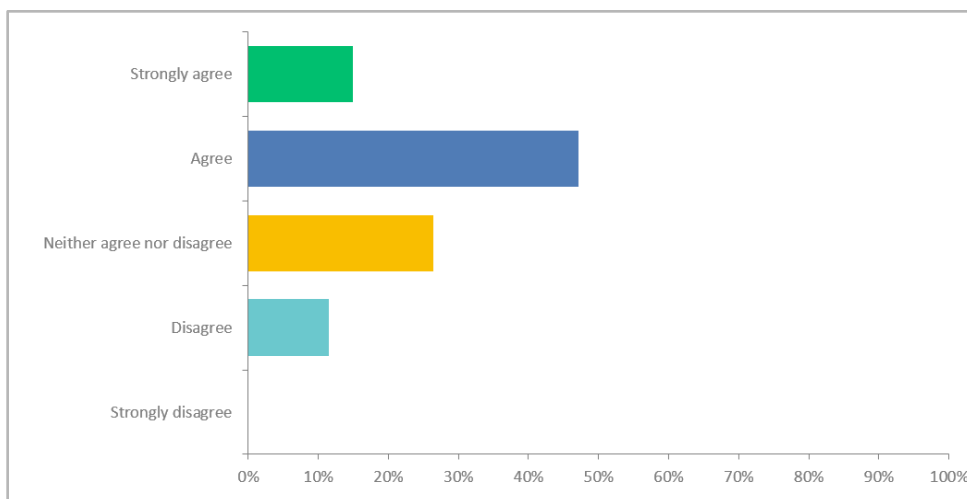
Figure 8: I felt the game is appropriately challenging for the students



Source: [Dig4Life Questionnaire for teachers]

Figure 8 shows that 63.95% of the teachers consider that the game is appropriately challenging for the students while only 8.14% disagree (55.81% less than the percentage of teachers who agree).

Figure 9: The game provides new challenges to the students at an appropriate pace

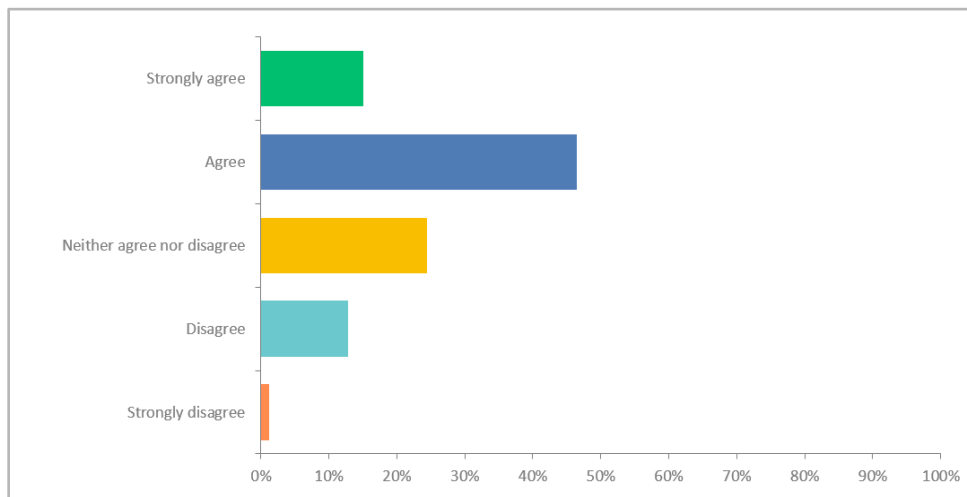


Source: [Dig4Life Questionnaire for teachers]

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The data represented in [Figure 9](#) show that 62.07% of the teachers agree the game provides new challenges to the students at an appropriate pace while only 11.49% disagree.

Figure 10: The game does not become monotonous as it progresses



Source: [Dig4Life Questionnaire for teachers]

The data of [Figure 10](#) shows that 61.63% of the teachers think that the game does not become monotonous as it progresses while 13.95% disagree (47.68% less than the percentages of teachers who agree).

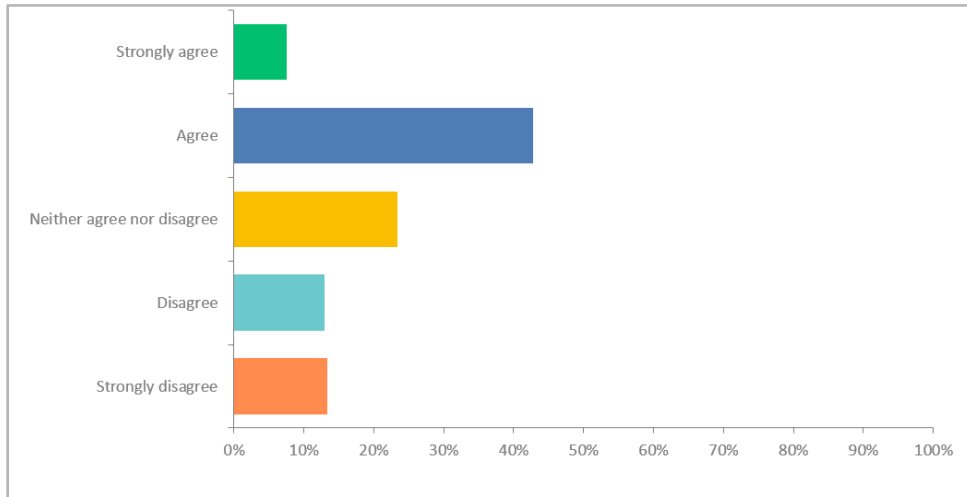
■ **Satisfaction**

■ Student evaluation analysis:

This section includes the analysis of the students' perception about the effect that their effort playing the game has on the digital competences learning.

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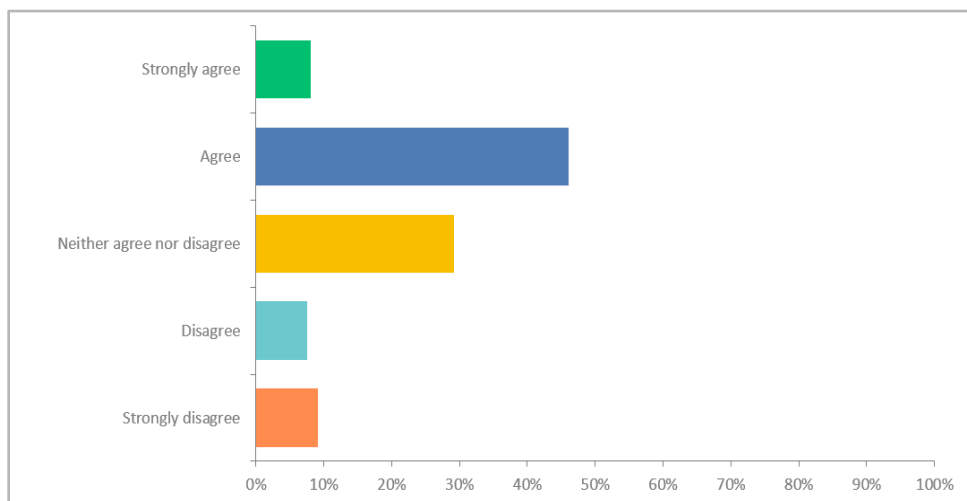
Figure 11: Completing the game tasks gave me a satisfying feeling of accomplishment



Source: [Dig4Life Questionnaire for students]

Analysing the data of [Figure 11](#), it is observed that 50.33% of the students have a satisfying sense of accomplishment by playing the game while 26.28% do not have this feeling (24.05% less than the percentage of students satisfied with their sense of achievement). The rest with 23.39% neither agree nor disagree.

Figure 12: It is due to my effort that I managed to advance in the game

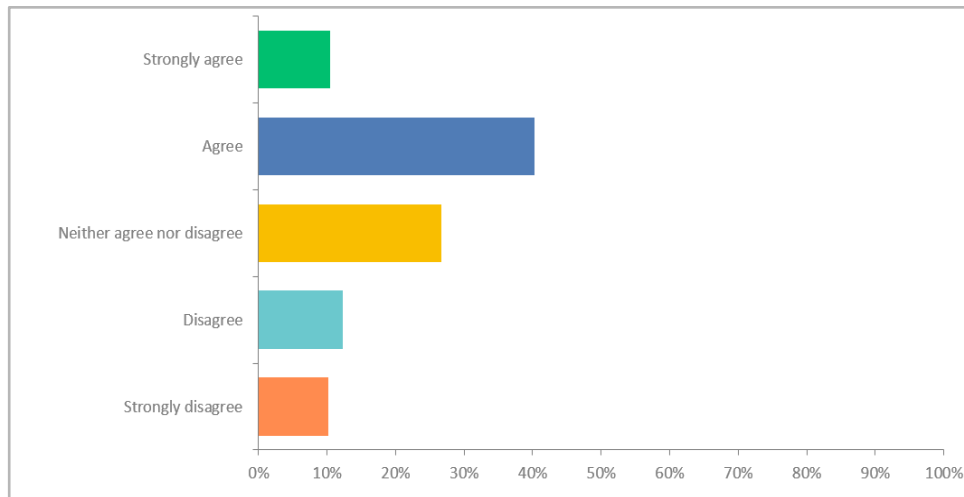


Source: [Dig4Life Questionnaire for students]

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The data shown in [Figure 12](#) indicate that 60.9% of the students think that they advanced in the game due to their personal effort while 20.1% disagree (40.8% less than the percentage of students who agree).

Figure 13: I feel satisfied with what I became aware of from playing the game

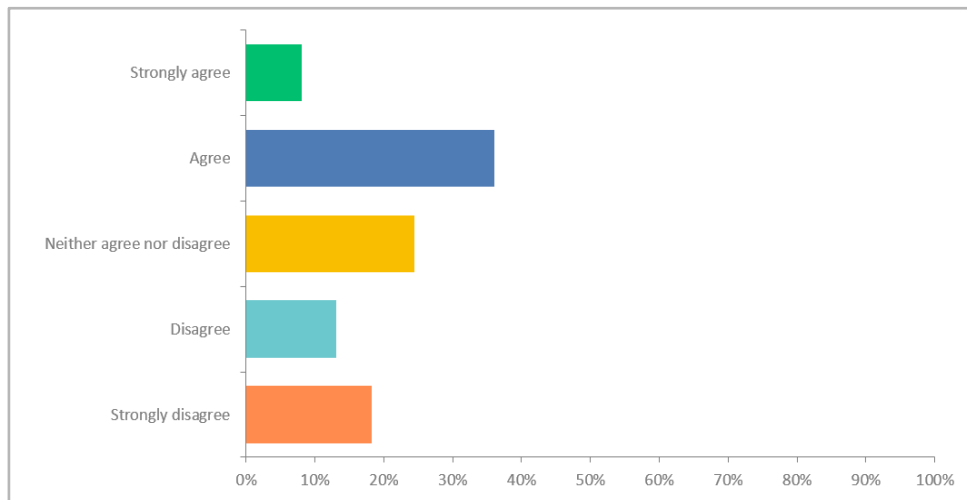


Source: [Dig4Life Questionnaire for students]

[Figure 13](#) shows that 50.78% of the students feel satisfied with what they became aware of from playing the game while 22.49% disagree (28.29% less than the percentage of students who agree).

Figure 14: I would recommend the game to my friends.

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Source: [Dig4Life Questionnaire for students]

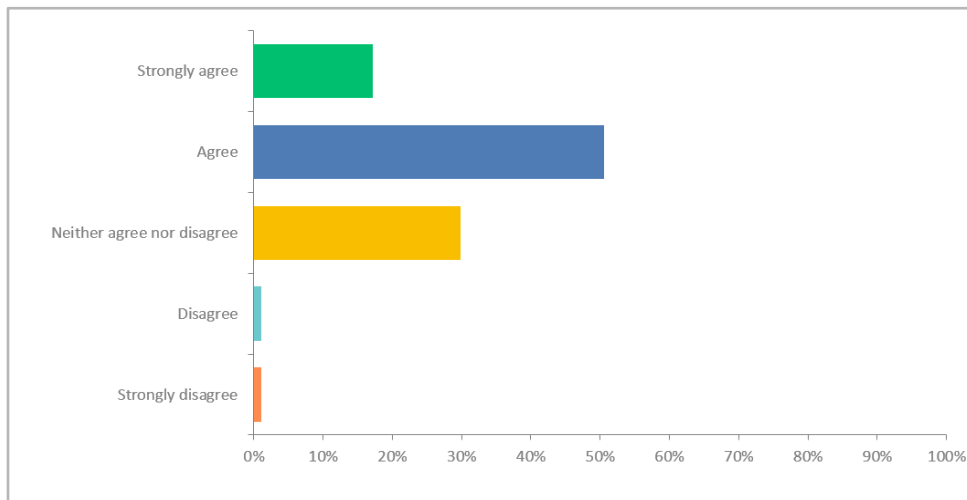
Figure 14 shows that 44.10% of the students would recommend the game to their friends while 31.40% would not recommend it. It is observed that the difference between these two percentages is not very large (12.70%).

■ Teacher evaluation analysis:

This section contains the analysis of teachers' perception about the satisfaction the game provides to both students and teachers.

Figure 15: I noticed that by completing the game tasks the students had a feeling of accomplishment

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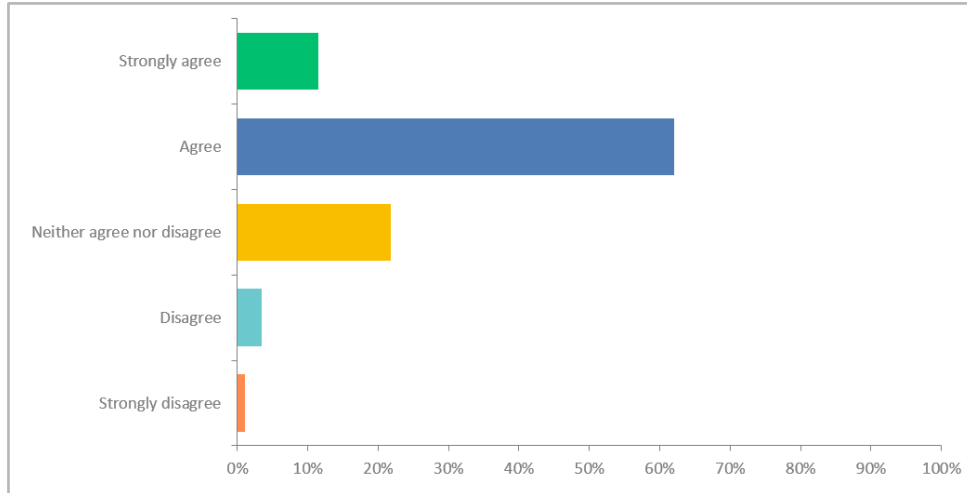
Source: [Dig4Life Questionnaire for teachers]

Figure 15 shows that 67.81% of the teachers noticed that the students had a feeling of accomplishment by completing the game tasks and only 2.30% disagree.

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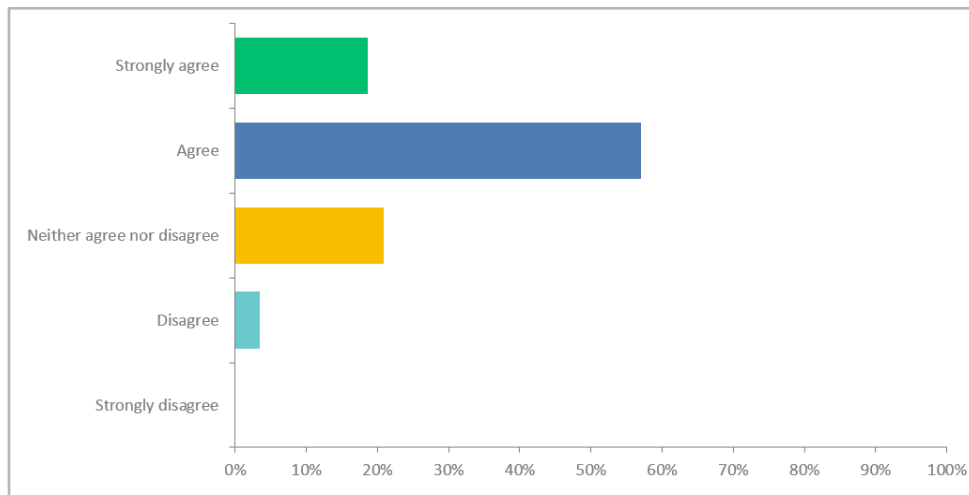
Figure 16: I noticed that it is due to the student's effort that they managed to advance in the game



Source: [Dig4Life Questionnaire for teachers]

The data represented in [Figure 16](#) indicate that the percentage of teachers who think that due to the students' personal effort they managed to advance in the game is very high (73.56%), only 4.60% of the teachers disagree with this statement and 21.84% neither agree nor disagree.

Figure 17: I feel satisfied with what the students became aware of from playing the game

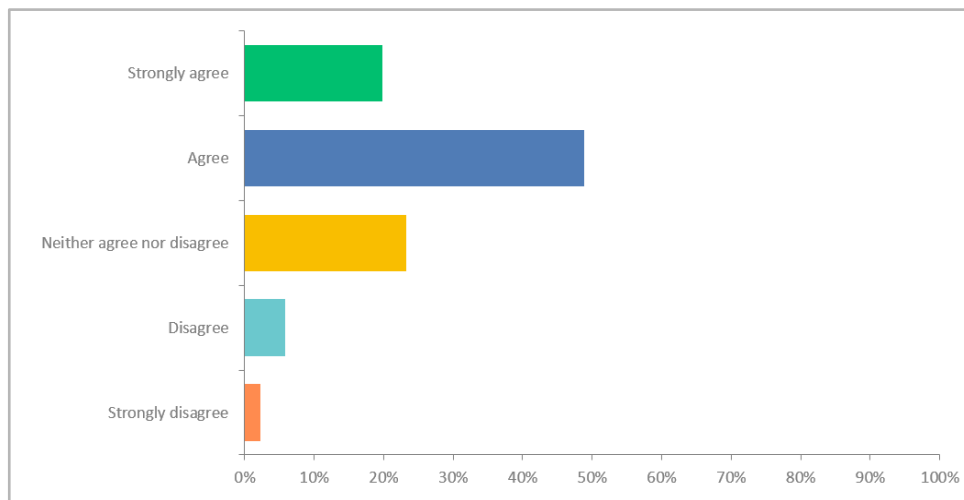


Source: [Dig4Life Questionnaire for teachers]

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From the analysis of the data represented in [Figure 17](#), it is observed that 75.58% of the teachers feel satisfied with what the students became aware of from playing the game while only 3.49% feel dissatisfied (72.09% less than the percentage of teachers satisfied).

Figure 18: I would recommend other teachers to use this game in their courses



Source: [Dig4Life Questionnaire for teachers]

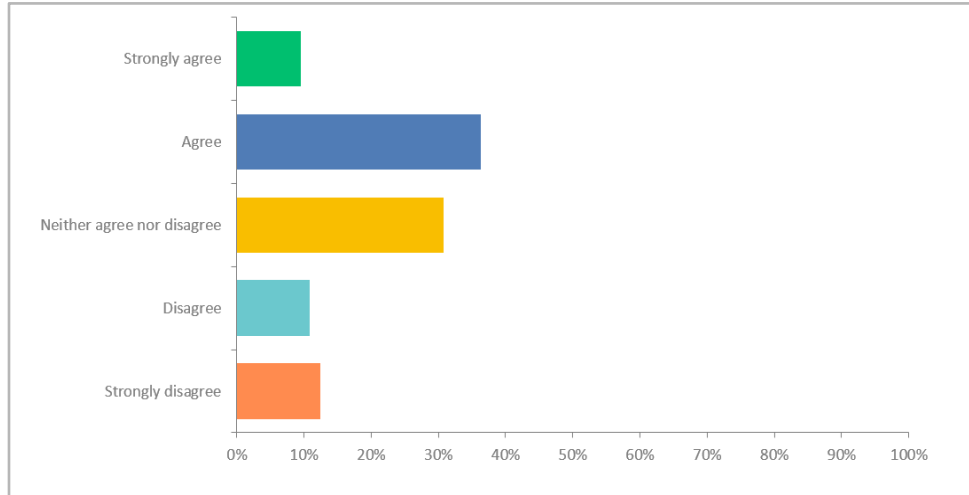
The data represented in [Figure 18](#) show that 68.61% of the teachers would recommend other teachers to use the game while only 8.14% would not recommend it. The difference between these two percentages is large and equals to 60.47%.

- ***Focused attention***
- *Student evaluation analysis:*

This section includes the analysis of the students' opinion about their level of focused attention in the game.

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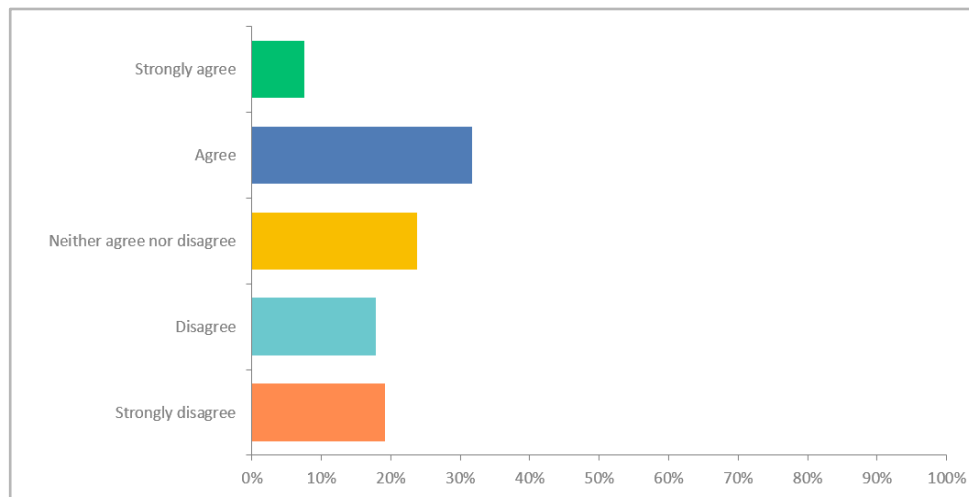
Figure 19: There was something interesting at the beginning of the game that captured my attention



Source: [Dig4Life Questionnaire for students]

Figure 19 shows that 45.88% of the students consider that there was something interesting at the beginning of the game that captured their attention while 23.38% disagree (22.50% less than the percentage of students who agree).

Figure 20: I was so involved in the game that I lost track of time

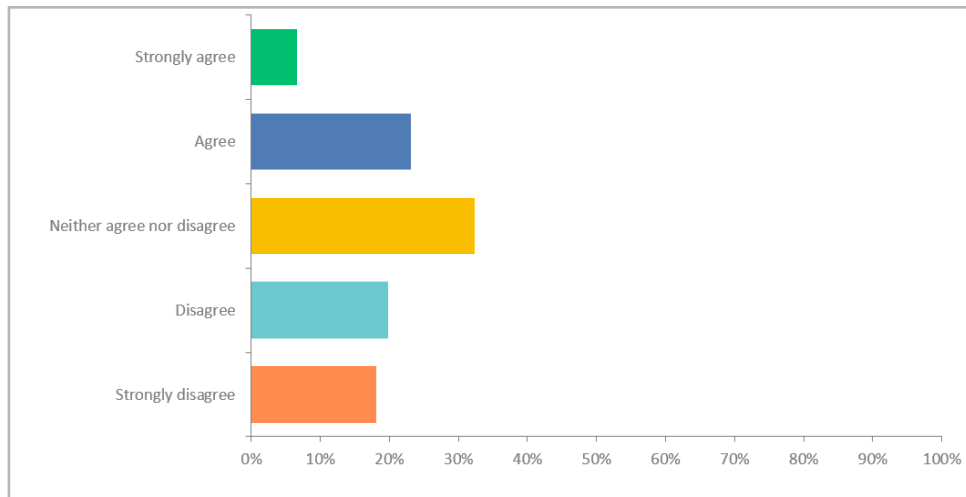


Source: [Dig4Life Questionnaire for students]

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Figure 20 shows that the percentage of students that consider they were so involved in the game that they lost track of time is equal to 39.20% and 36.97% disagree.

Figure 21: I forgot about my immediate surroundings while playing the game



Source: [Dig4Life Questionnaire for students]

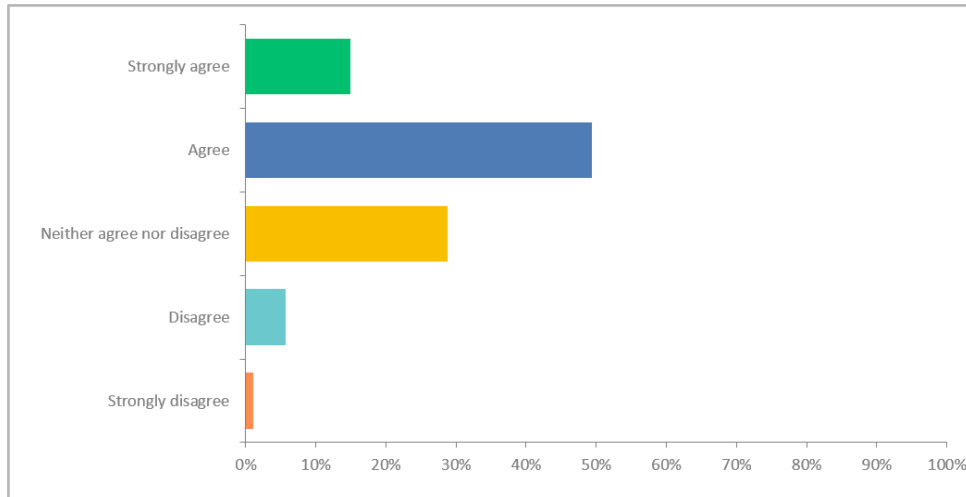
The data represented in Figure 21 indicate that the percentage of students who think that they did not forget about the immediate surroundings while playing the game (37.86%) is a little higher than the percentage of students who think otherwise (29.84%) and 32.29% of the students neither agree nor disagree.

■ Teacher evaluation analysis:

This section contains the analysis of the teachers' perception about the focused attention that the game provides to the students.

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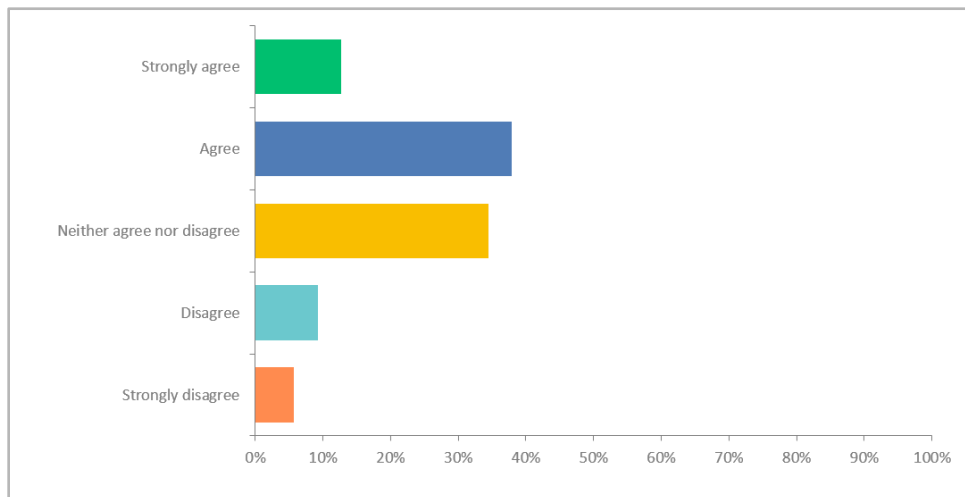
Figure 22: There was something interesting at the beginning of the game that captured the student's attention



Source: [Dig4Life Questionnaire for teachers]

Figure 22 shows the data of the teachers' perception on whether there was something interesting at the beginning of the game that captured the students' attention. It is observed that 64.37% of the teachers agree with this statement, only 6.90% disagree and 28.74% neither agree nor disagree.

Figure 23: The students were so involved in the gaming tasks that they lost track of time

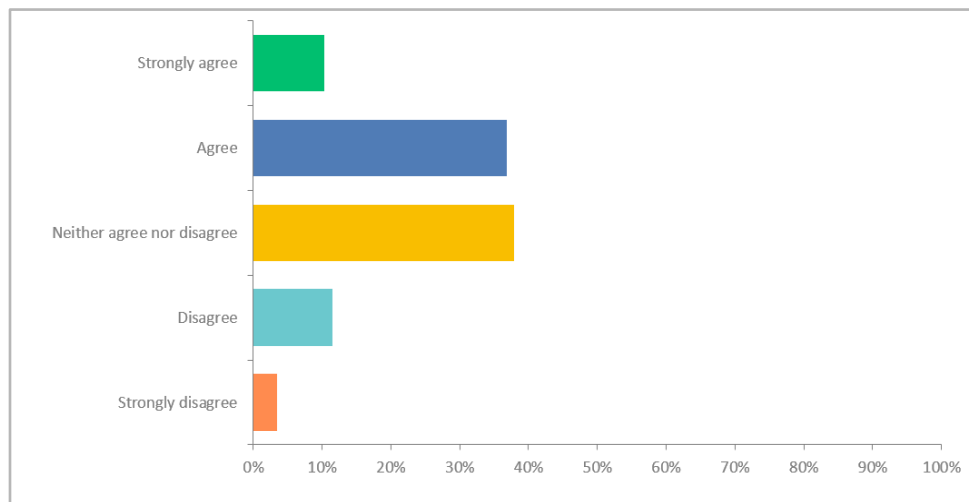


Source: [Dig4Life Questionnaire for teachers]

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Figure 23 shows that 50.57% of teachers agree with the idea that students were so involved in the gaming tasks that they lost track of time, followed by 34.48% who neither agree nor disagree. Only 14.95% of teachers disagree.

Figure 24: I felt that the students forgot about their immediate surroundings while playing the game



Source: [Dig4Life Questionnaire for teachers]

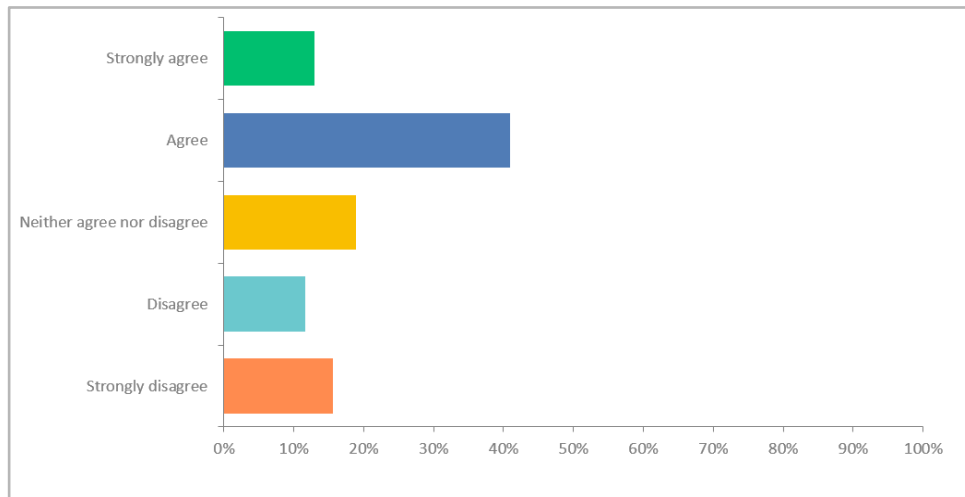
Figure 24 shows the data of the teachers' perception on whether the students forgot about their immediate surroundings while playing the game. It is observed that 47.12% of the teachers consider that the students forgot their environment, 14.94% disagree with this statement and 37.93% neither agree nor disagree.

- **Fun**
- Student evaluation analysis:

This section includes the analysis of the students' opinion regarding whether they find the game fun or not.

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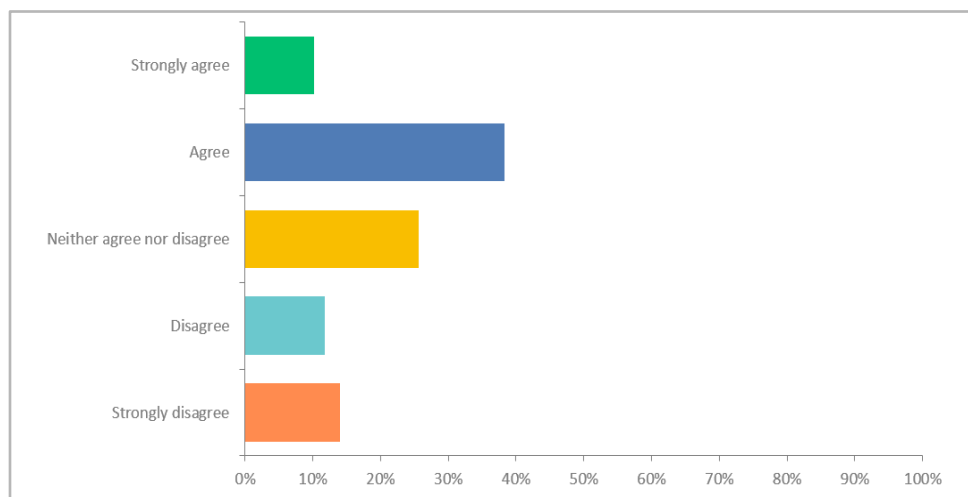
Figure 25: I had fun with the game



Source: [Dig4Life Questionnaire for students]

Analysing the data represented in [Figure 25](#), it is observed that the percentage of students that consider they had fun with the game equals to 53.90%, while 27.17% of the students think otherwise (26.73% less than the percentage of students who had fun playing).

Figure 26: Something happened during the game that made me smile



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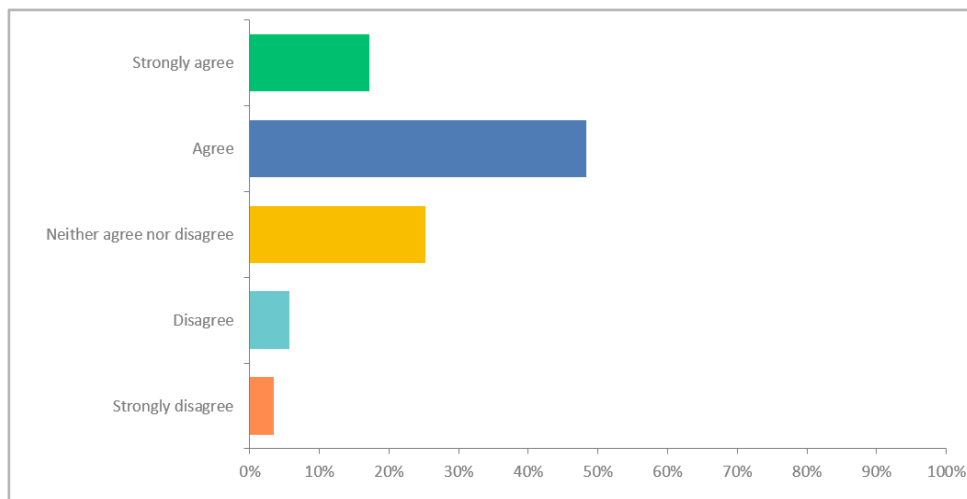
Source: [Dig4Life Questionnaire for students]

Figure 26 shows that the percentage of students who think that something happened during the game that made them smile is equal to 48.55%. On the other hand, 25.83% of the students found nothing in the game that made them smile.

■ Teacher evaluation analysis:

This section includes the analysis of the teachers' perception about the game providing fun to both students and teachers.

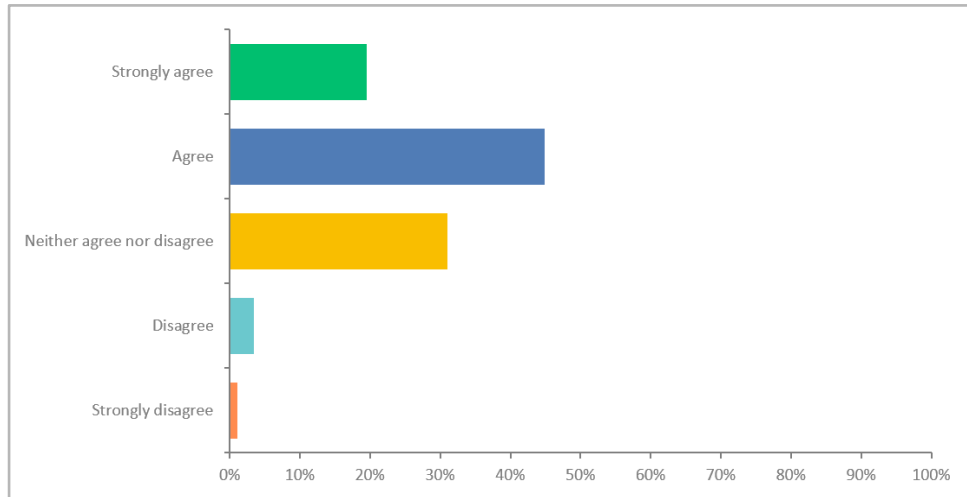
Figure 27: The students had fun with the game



Source: [Dig4Life Questionnaire for teachers]

Figure 27 shows that 65.52% of the teachers consider that students had fun playing the game, while only 9.20% think otherwise. Thus, the percentage of teachers who agree with the statement represented in this figure is 56.32% greater than the percentage of teachers who disagree.

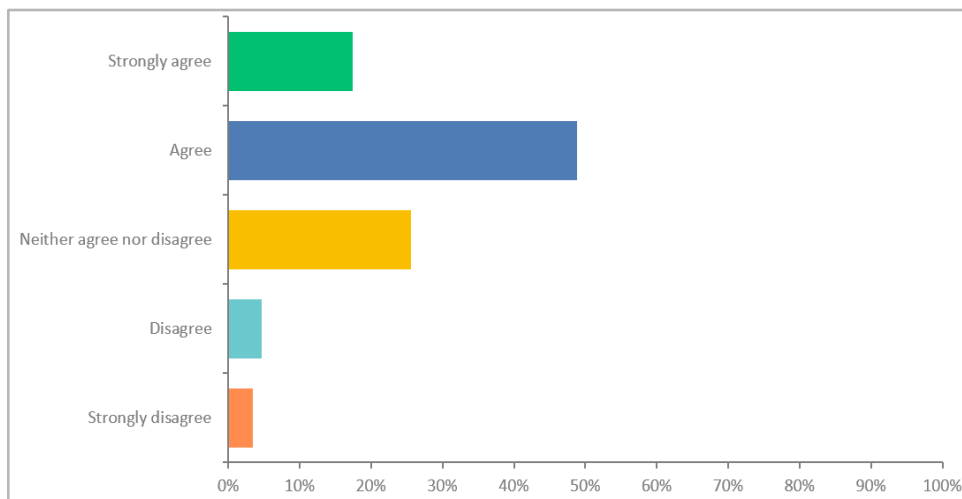
Figure 28: Something happened during the game which made the students smile



Source: [Dig4Life Questionnaire for teachers]

The data represented in [Figure 28](#) indicate that 64.37% of the teachers think that something happened during the game which made the students smile while only 4.60% think otherwise. It should be noted that 31.03% neither agree nor disagree.

Figure 29: I would like to use the game again in my courses



Source: [Dig4Life Questionnaire for teachers]

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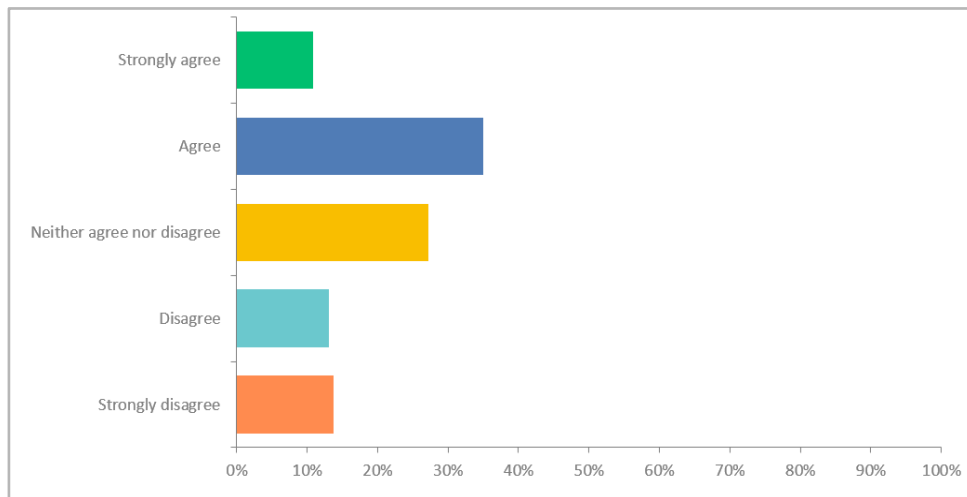
Figure 29 shows the teachers' opinion regarding their willingness to use the game again in their courses. It is observed that a high percentage 66.28% of teachers would use it again and only 8.14% would not use it anymore.

■ **Relevance**

■ Student evaluation analysis:

This section contains the analysis of the students' opinion on whether the contents of the game are consistent with their digital competences learning goals, and the game is an adequate tool to evaluate digital skills.

Figure 30: The game contents are relevant to my interests

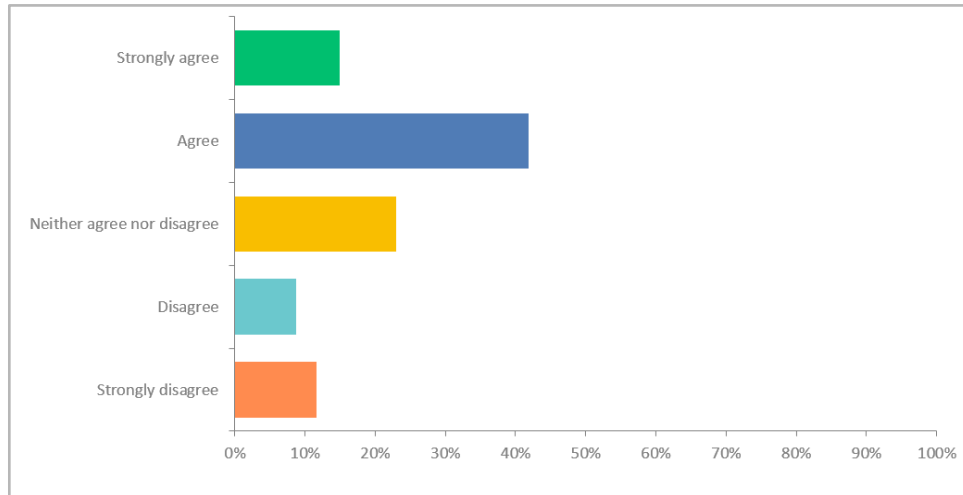


Source: [Dig4Life Questionnaire for students]

Figure 30 shows the students' opinion on whether the game contents are relevant to their interests. It is observed that 45.88% consider that the game contents are appropriate for them while 26.95% think otherwise (18.93% less than the percentage of students who consider the contents of the game are relevant to their interests).

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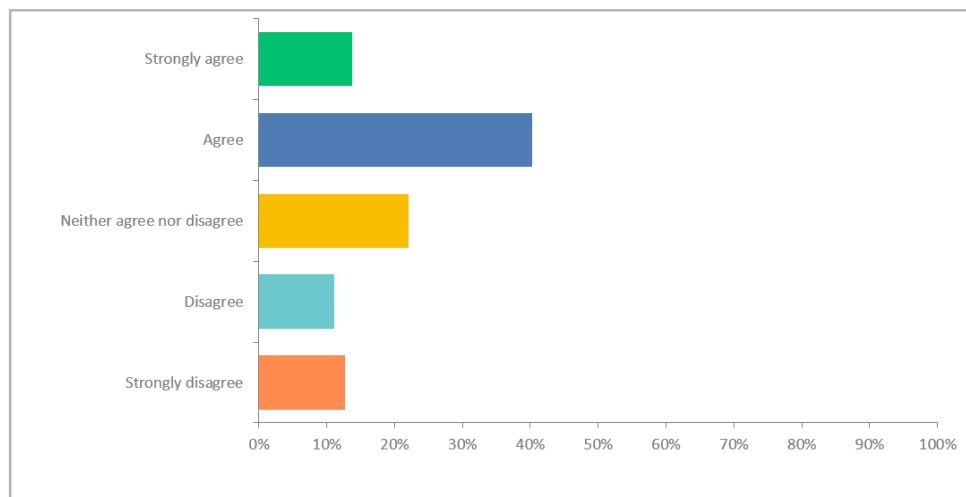
Figure 31: The game is an adequate tool to become aware of my level of digital competence



Source: [Dig4Life Questionnaire for students]

Figure 31 shows that 56.79% of the students think the game is an adequate tool to become aware of their level of digital competence while 20.27% disagree with this statement and 22.94% neither agree nor disagree.

Figure 32: I prefer using the game to find out about my level of digital competence than using other ways

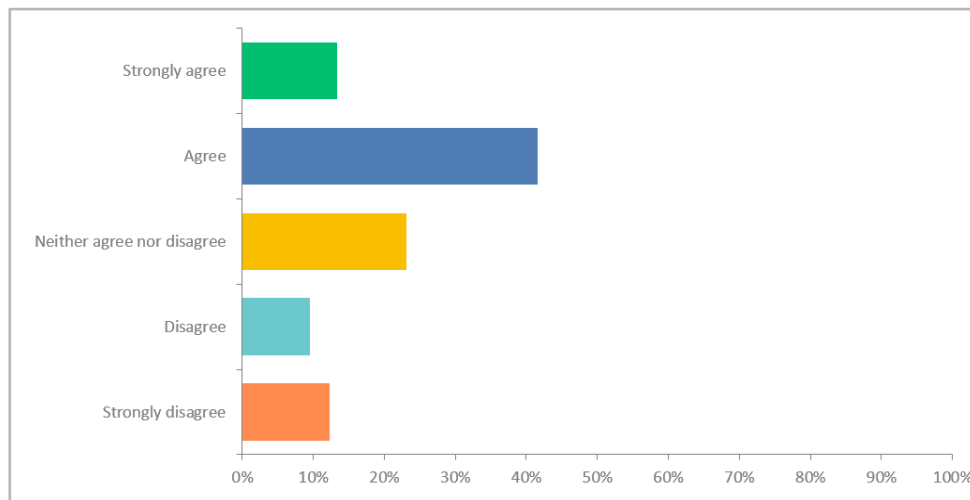


Source: [Dig4Life Questionnaire for students]

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Figure 32 shows that 54.12% of the students prefer using this game to assess their digital competence level than using other ways. This percentage is 30.29% higher than the percentage of students that would opt for another way of assessment (23.83%).

Figure 33: The game allowed me to set learning goals to improve my digital competence



Source: [Dig4Life Questionnaire for students]

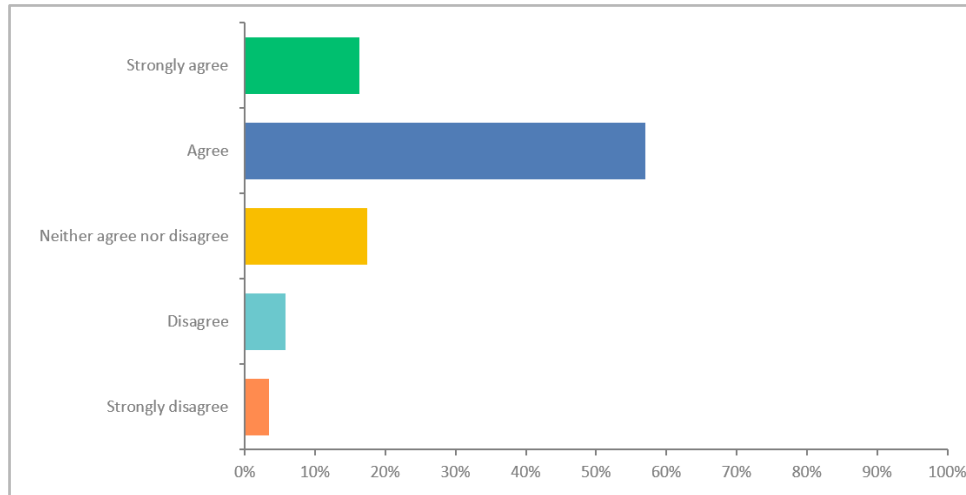
Figure 33 shows that 55.01% of the students agree that the game allows them to set learning goals to improve their digital skills while 21.83% disagree (33.18% less than the students who agree).

■ Teacher evaluation analysis:

This section contains the analysis of the teachers' perception about the relevance of the game for assessing the level of digital competence.

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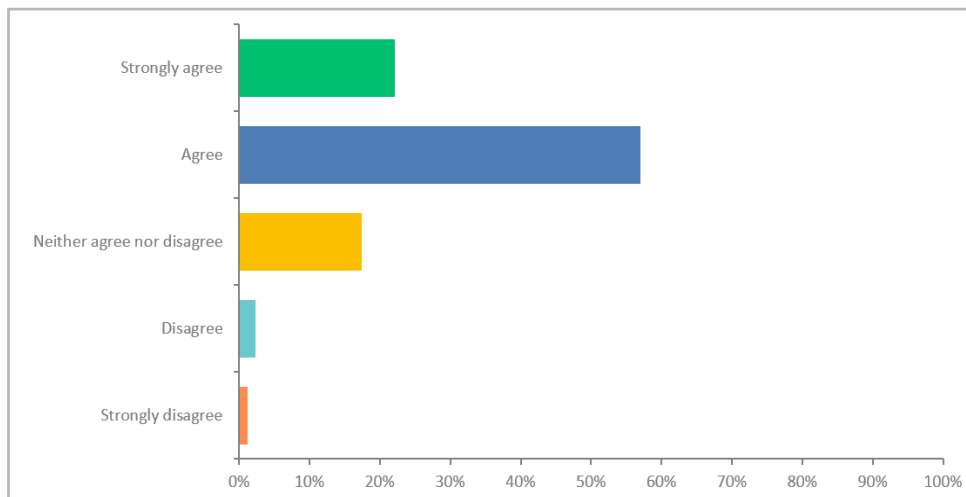
Figure 34: The game contents are relevant to the students' interests



Source: [Dig4Life Questionnaire for teachers]

Figure 34 shows the teachers' opinion on whether the game contents are relevant to their students' interests. It is observed that 73.26% of the teachers consider that playing the game is interesting for the students while only 9.31% disagree.

Figure 35: It is clear to me how the game contents are related to the different digital competences

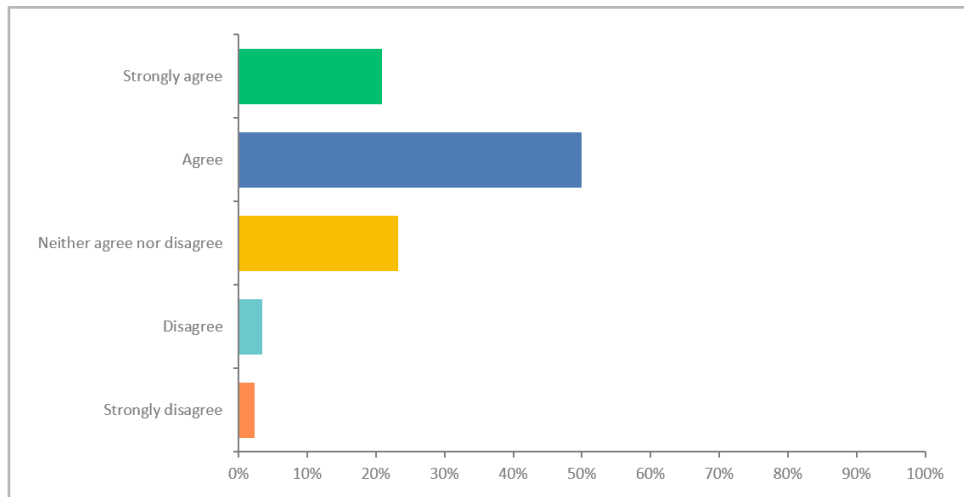


Source: [Dig4Life Questionnaire for teachers]

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Figure 35 shows that almost all teachers (79.07%) consider that the game contents are clearly related to the digital competences and only 3.49% disagree.

Figure 36: The game is an adequate tool for assessing the students' digital competence

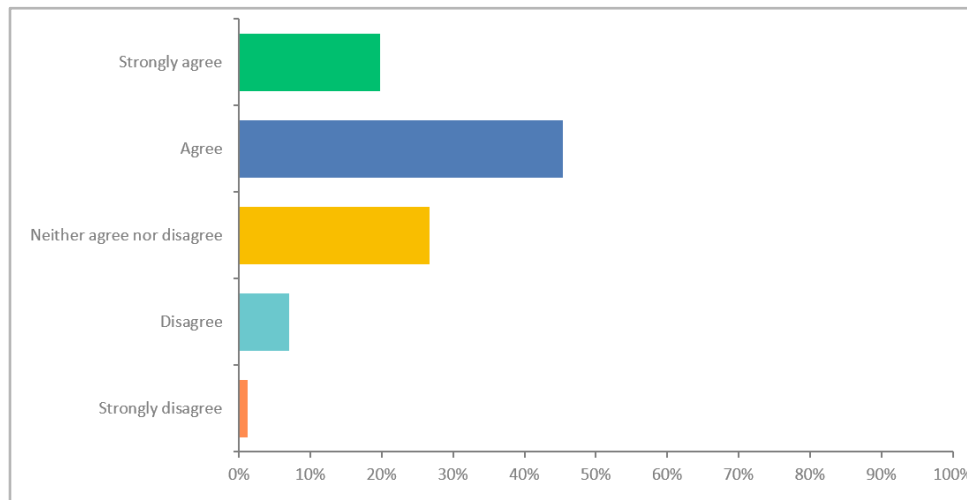


Source: [Dig4Life Questionnaire for teachers]

Figure 36 shows that a high percentage of teachers (70.93%) consider the game a suitable tool for assessing digital competences while only 5.89% disagree.

Figure 37: I prefer using the game to assess the student's digital competence than other ways

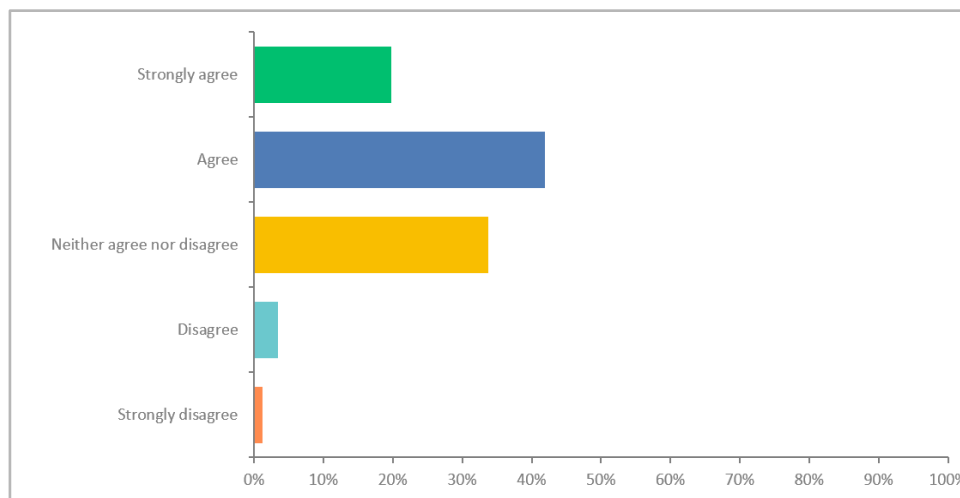
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Source: [Dig4Life Questionnaire for teachers]

Figure 37 shows that most teachers (65.12%) prefer using the game to evaluate digital skills than other tools while only 8.14% disagree.

Figure 38: The game allowed me to set learning goals to improve my students' digital competence



Source: [Dig4Life Questionnaire for teachers]

The data represented in Figure 38 indicate that 61.63% of the teachers consider that the game allows them to set learning goals to improve the digital skills of students while only 4.65% disagree.

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■ ***Final analysis of player experience quality factor***

After analysing the answers of the items selected to evaluate the different dimensions of the user experience quality factor, we can conclude the following:

- **Challenge.** It is observed that 51.23% of the students consider that the game is appropriately challenging and 54.56% that the challenges appear at an adequate pace, however only 38.53% agree that the game does not become monotonous as it progresses. The teachers have valued better than the students all items of the challenge dimension. On the one hand, 63.95% of the teachers consider the game appropriately challenging (12.72% more than students). On the other hand, 61.63% of the teachers think that the game does not become monotonous as it progresses (23.10% more than students). However, the percentage of teachers who think that the game provided new challenges at an appropriate pace (62.07%) is 7.51% more than the percentage of students who agree with this statement.
- **Satisfaction.** The results obtained indicate that around 50.78% of the students feel satisfied with what they became aware of from playing the game. Besides, 44.10% of the students would recommend the game to their friends. A higher percentage of teachers than students are satisfied with the game. Teachers (67.81%) think that the students had a feeling of accomplishment by completing the game tasks. The percentage of teachers who disagree with this satisfaction item is only 2.30%, and 68.61% would recommend other teachers to use the game.
- **Focused attention.** The percentage of teachers that consider that there was something interesting at the beginning of the game that captured student's attention (64.37%) is greater than the percentage of students (45.88%) agreeing on such a claim. In addition, the percentage of teachers that consider the students forgot about their surroundings (47.12%) is also greater than the percentage of students (29.84%). The percentage of teachers that think the students were so involved in the game that they lost track of time (50.57%) is also higher than the percentage of students (39.20%) that recognize that happening. All items in this section are rated better by teachers than by students.
- **Fun.** The percentage of students that had fun with the game is 53.90% and 48.55% think that while playing the game something happened that made them smile. The teachers' opinion about the fun of the game is

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better than the students. 65.52% of the teachers consider that the students had fun with the game and 64.37% that the game made them smile. Besides, 66.28% of the teachers would like to use the game again in their courses.

- **Relevance.** The game relevance to evaluate students' digital skills is better valued by teachers than by students. On the one hand, the percentage of students who agree that the contents of the game are relevant to their interests is 45.88%, while the percentage of students who disagree is 26.95%. On the other hand, the percentage of teachers who agree that the game contents are relevant to the students' interests is very high 73.26%. Also 70.93% of teachers think that this game is an adequate tool for assessment of digital competence, while 56.79% of students think that the game is an adequate tool to become aware of their level of digital competence.

2.3

Quality factor: Usability

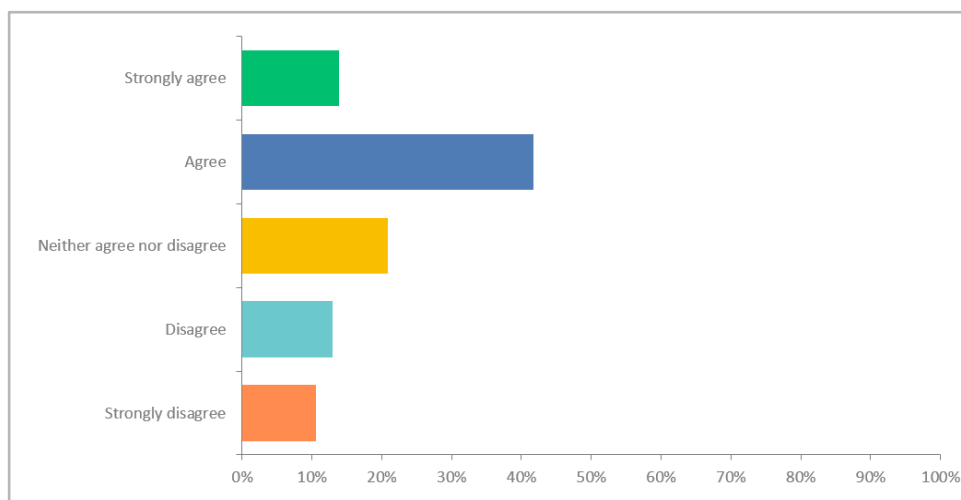
This section includes the data analysis of the items of the usability quality factor (see [Table 2](#)) collected in the game experiences performed.

- **Aesthetics**

- Student evaluation analysis:

This section includes the analysis of the students' opinion on whether the game interface enables them a pleasing and satisfying interaction.

Figure 39: The game design is attractive



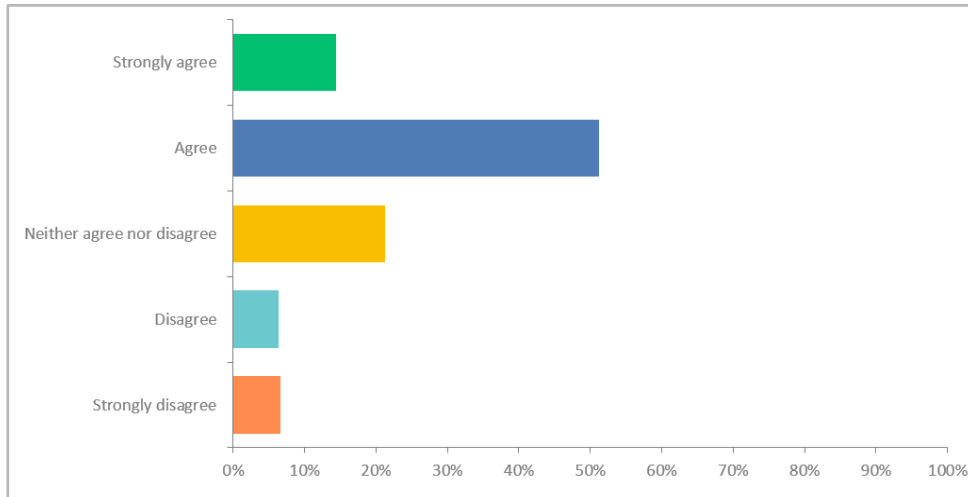
Source: [Dig4Life Questionnaire for students]

The data represented in [Figure 39](#) indicate that more than half of the students (55.53%) consider the game design attractive while 23.62% disagree and 33.72% neither agree nor disagree.

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Figure 40: The text font and colours are well blended and consistent



Source: [Dig4Life Questionnaire for students]

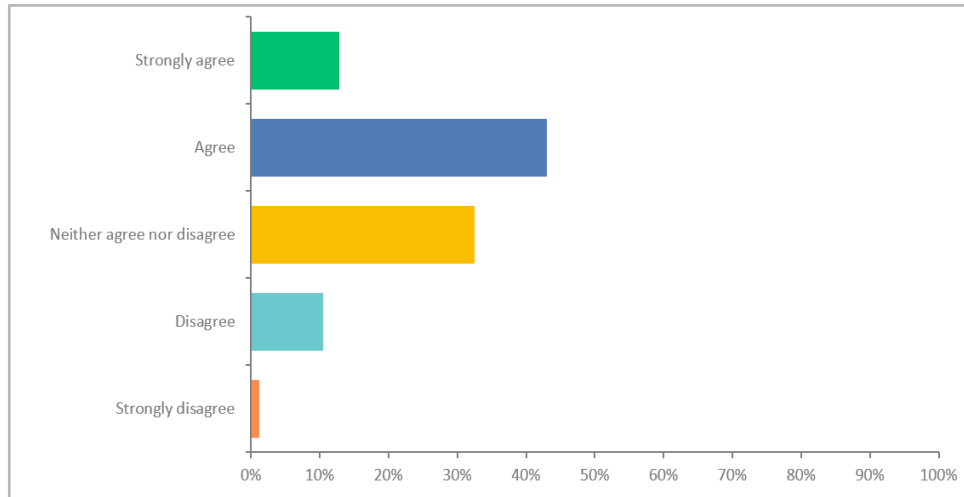
Figure 40 shows that the percentage of students who agree the text font and colours are well blended and consistent (66.75%) is much higher than the percentage of students who disagree with this game feature (12.98%).

■ Teacher evaluation analysis:

This section contains the analysis of the teachers' perception on whether the game interface allows them to interact in a pleasant and satisfying way.

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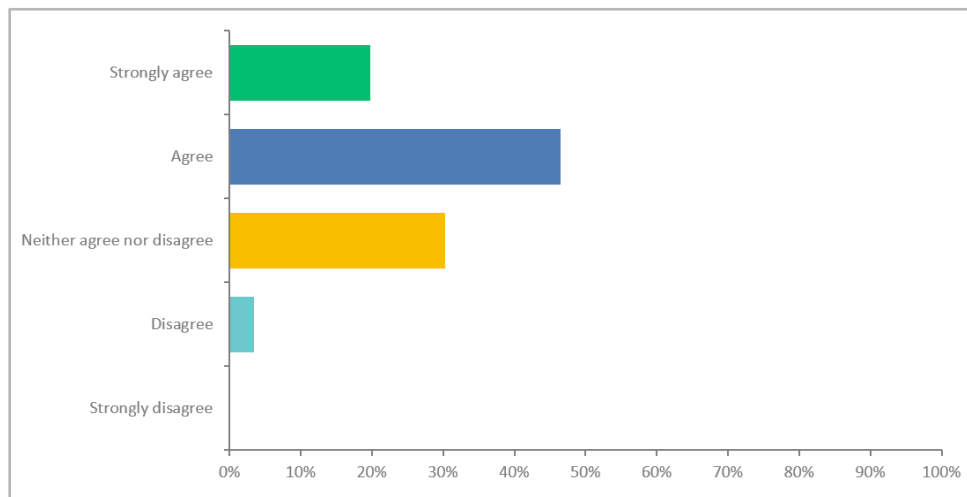
Figure 41: The game design is attractive



Source: [Dig4Life Questionnaire for teachers]

Figure 41 indicates that almost all the teachers who have given their opinion about whether the game design is attractive or not, consider that the game is attractive (55.81%). Only 11.63% of the teachers disagree with the claim that the game is attractive.

Figure 42: The text font and colours are well blended and consistent



Source: [Dig4Life Questionnaire for teachers]

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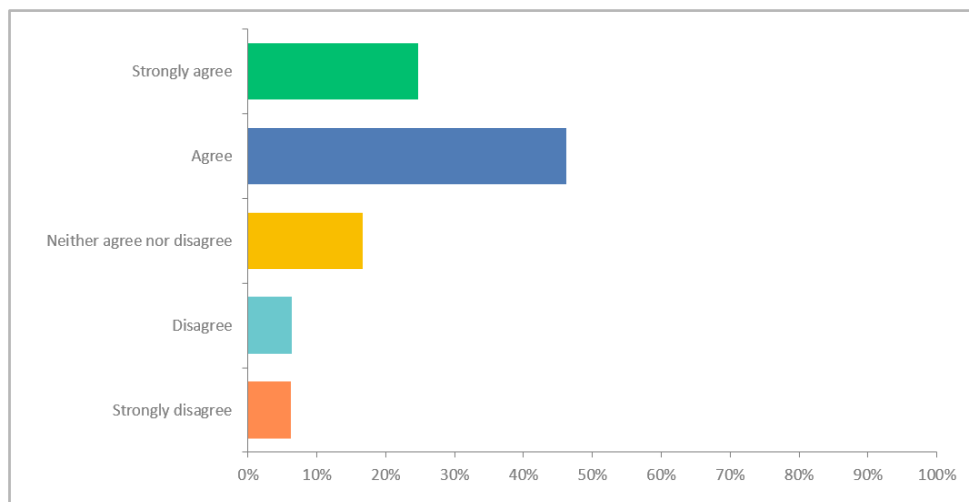
The data represented in [Figure 42](#) indicate that 66.28% of the teachers consider the text font and colours are well blended and consistent and only 3.49% disagree with this game feature.

■ **Operability**

■ Student evaluation analysis:

This section includes the analysis of the students' opinion on whether the game is easy to play and the game rules are clear and easy to understand.

Figure 43: I think that the game is easy to play

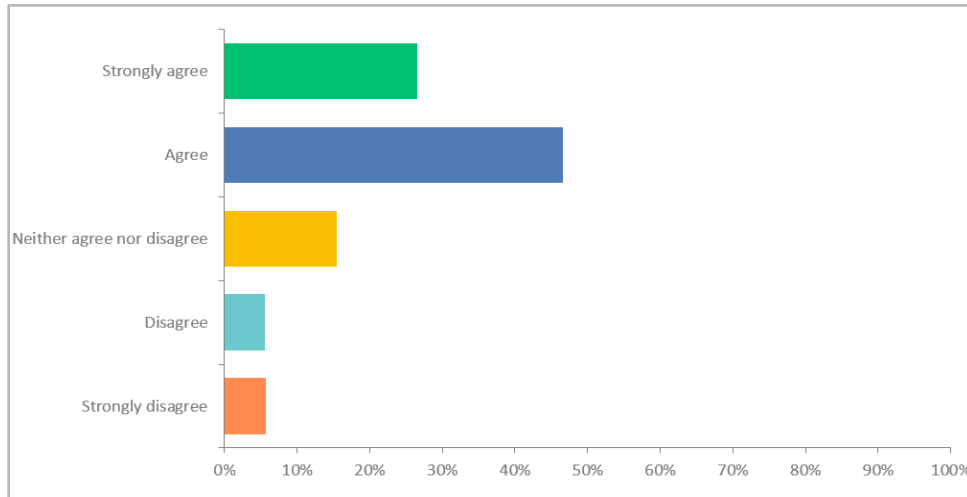


Source: [Dig4Life Questionnaire for students]

[Figure 43](#) shows that 70.85% of students think the game is easy to play while 12.55% think otherwise. Thus, the percentage of students who agree with this game characteristic is 58.30% higher than the percentage of students who disagree.

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Figure 44: The game rules are clear and easy to understand



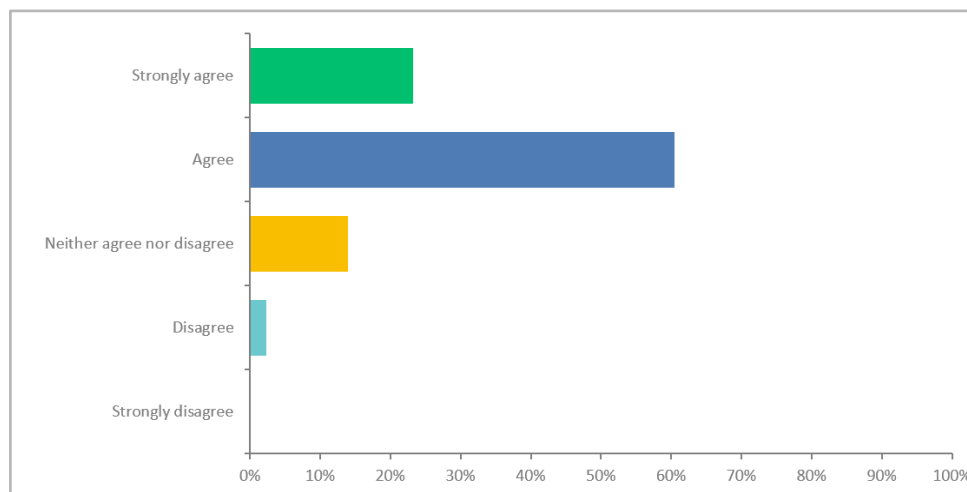
Source: [Dig4Life Questionnaire for students]

Figure 44 indicates that the percentage of students who agree the game rules are clear and easy to understand is also quite high 73.20% and only 11.27% disagree.

■ Teacher evaluation analysis:

This section includes the analysis of the teachers' opinion on whether the game is easy to play and the game rules are precise and easy to understand.

Figure 45: Explaining the rules of the game was easy for me

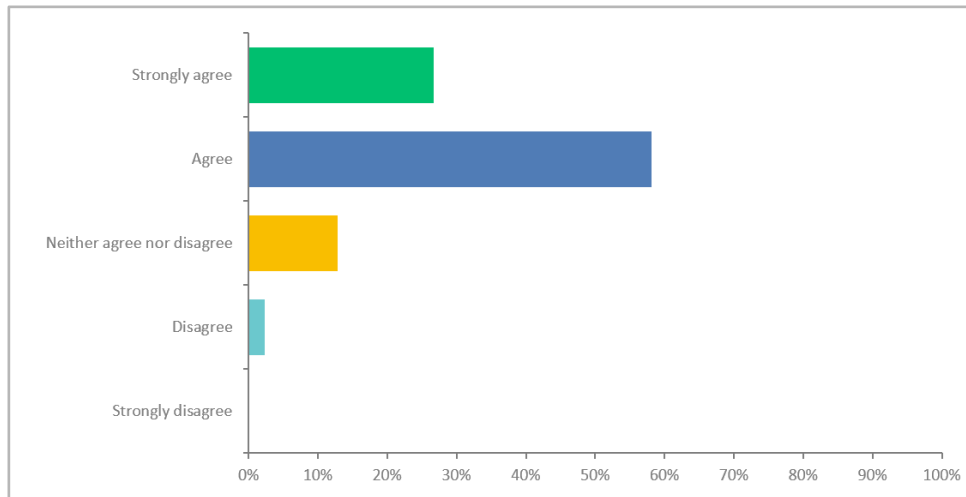


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Source: [Dig4Life Questionnaire for teachers]

Figure 45 shows that 83.73% of the teachers think that it is easy to explain the rules of the game to the students.

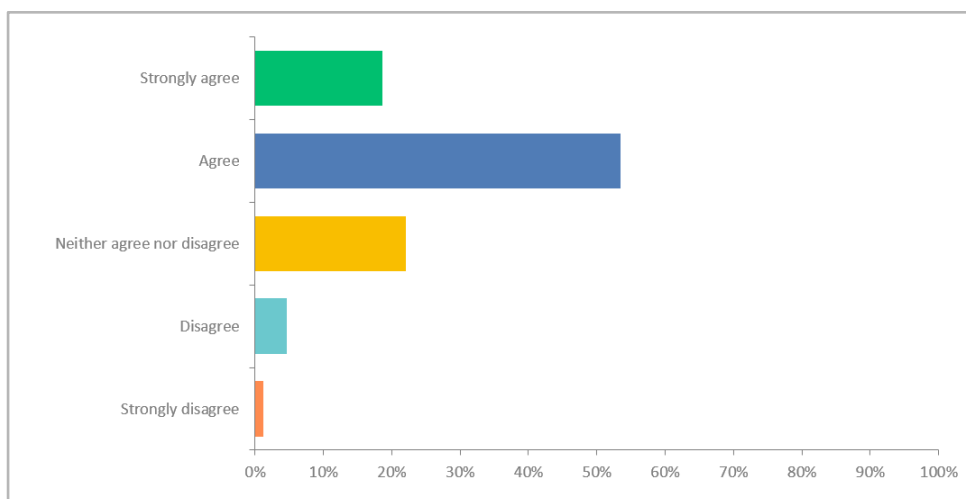
Figure 46: The game rules are clear and easy to understand



Source: [Dig4Life Questionnaire for teachers]

Figure 46 shows the teachers' opinion about the game rules are clear and easy to understand. It is observed that 84.18% the teachers also agree with this item of the operability dimension and only 2.33% disagree.

Figure 47: It was easy to use the game in my course

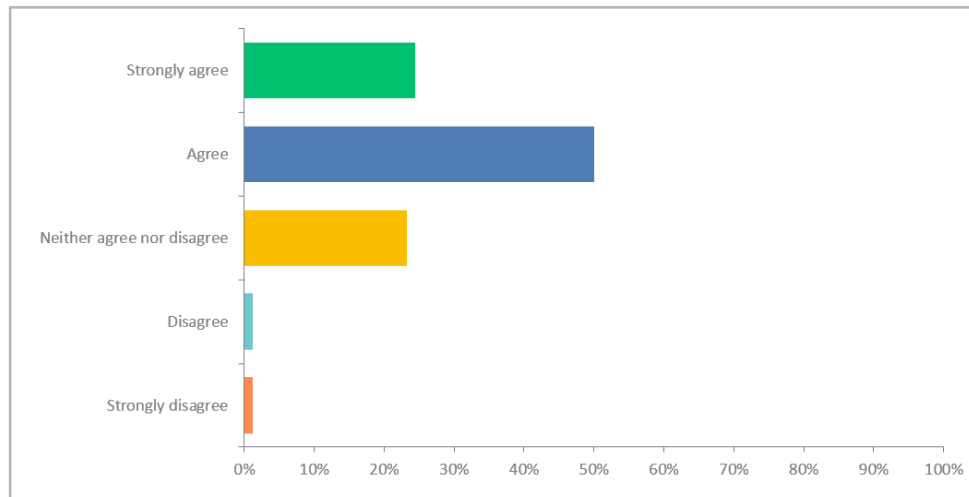


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Source: [Dig4Life Questionnaire for teachers]

The data shown in [Figure 47](#) indicate that most teachers (72.09%) consider that it was easy to use the game in their courses while only 5.81% disagree.

Figure 48: I think that the game is easy to play



Source: [Dig4Life Questionnaire for teachers]

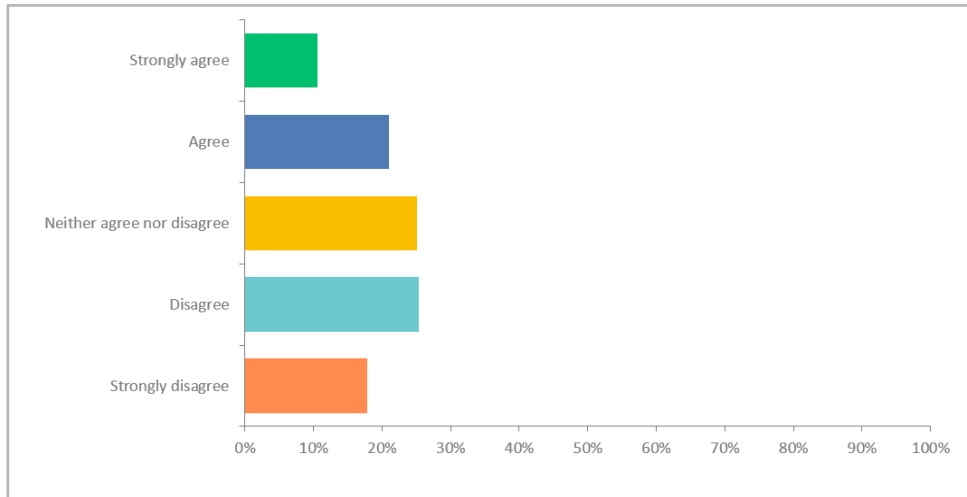
The last item of the operability dimension has also been highly valued by most teachers. [Figure 48](#) shows that 74.42% of the teachers consider that the game is easy to play and only 2.32% disagree.

- **Learnability**
- Student evaluation analysis:

This section includes the analysis of the students' opinions on the perceived ease of learning to play the game.

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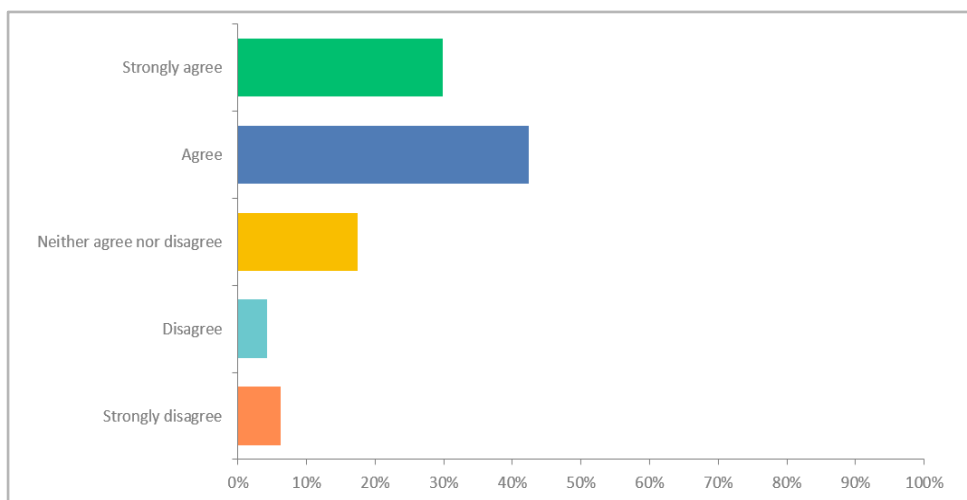
Figure 49: I needed to learn a few things before I could play the game



Source: [Dig4Life Questionnaire for students]

Figure 49 shows that 31.70% of the students think that it is necessary to learn some things before playing the game while very high percentage 43.19% think otherwise.

Figure 50: Learning to play the game was easy for me

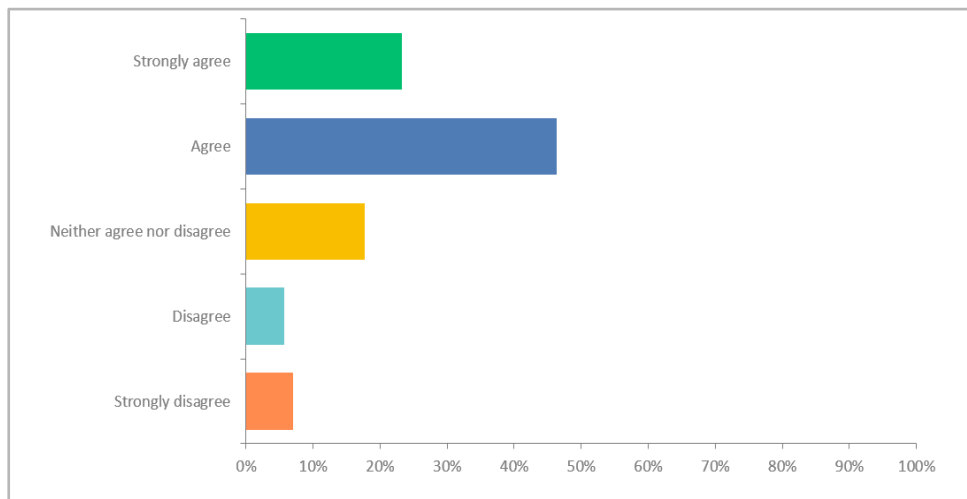


Source: [Dig4Life Questionnaire for students]

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The data shown in [Figure 50](#) indicate that a high percentage of students (72.13%) consider that it was easy for them to learn to play while only 10.43% disagree with this statement.

Figure 51: I think that most people would learn to play the game very quickly



Source: [Dig4Life Questionnaire for students]

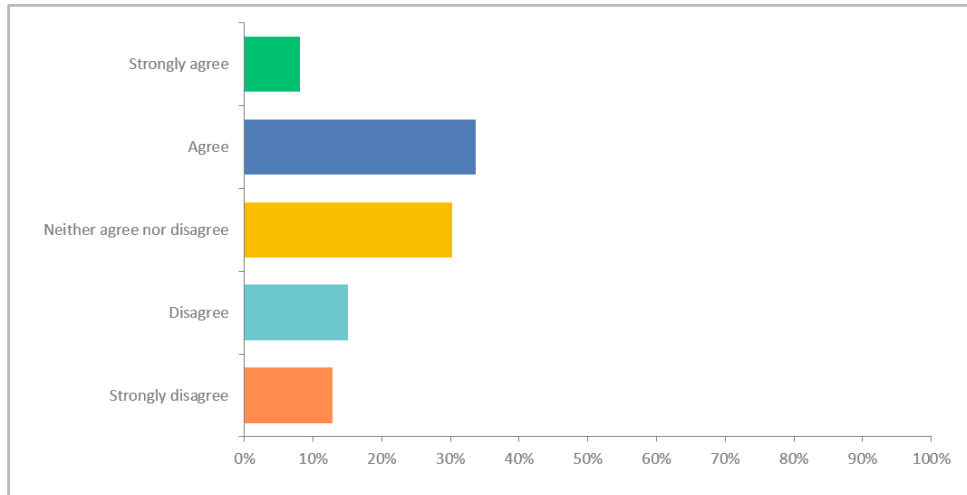
The percentages of students who agree or disagree with the statement represented in [Figure 51](#) are similar to the percentages of the statement represented in [Figure 50](#). It is observed that 69.57% of the students think that most people would learn to play the game very quickly and 12.74% disagree.

■ Teacher evaluation analysis:

This section contains the analysis of the teachers' opinion about the learnability items. The first two items have also been evaluated by the students and the third one collects the teachers' opinion on whether most of the students would learn to play the game quickly.

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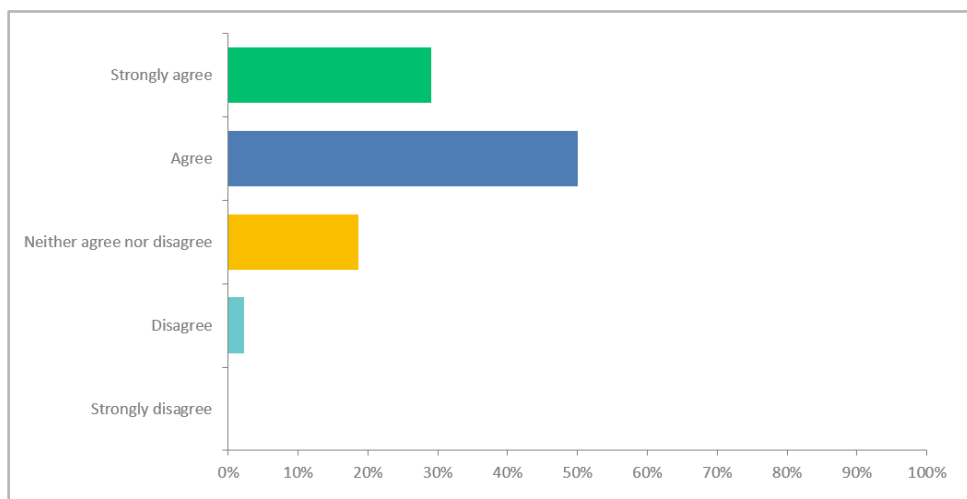
Figure 52: I needed to learn a few things to understand the game



Source: [Dig4Life Questionnaire for teachers]

The data represented in [Figure 52](#) show that 41.86% of the teachers consider that it is not necessary to learn new things to be able to play the game, 27.91% disagree with that and 30.23% neither agree nor disagree.

Figure 53: Learning to play the game was easy for me

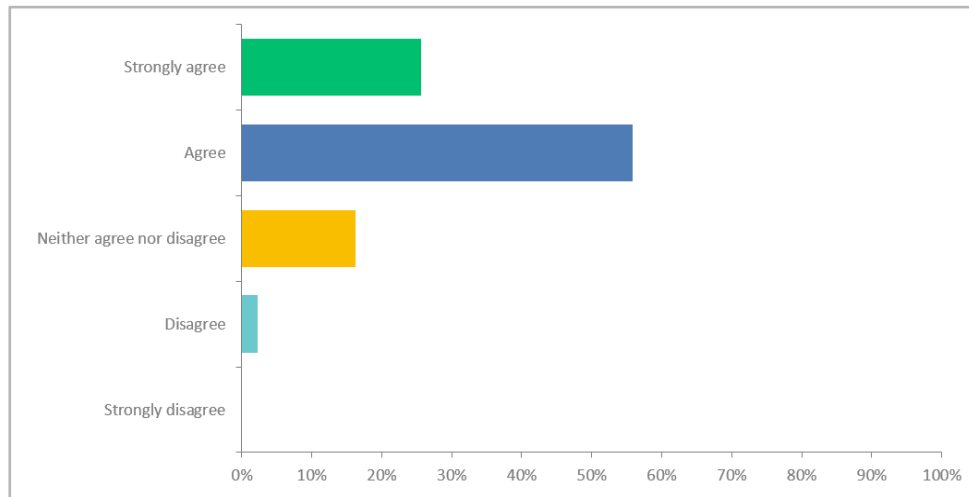


Source: [Dig4Life Questionnaire for teachers]

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The statement represented in [Figure 53](#) has also been highly rated by the teachers since 79.07% of them think that learning to play the game is easy and only 2.33% disagree.

Figure 54: I think that most of the students would learn to play the game very quickly



Source: [Dig4Life Questionnaire for teachers]

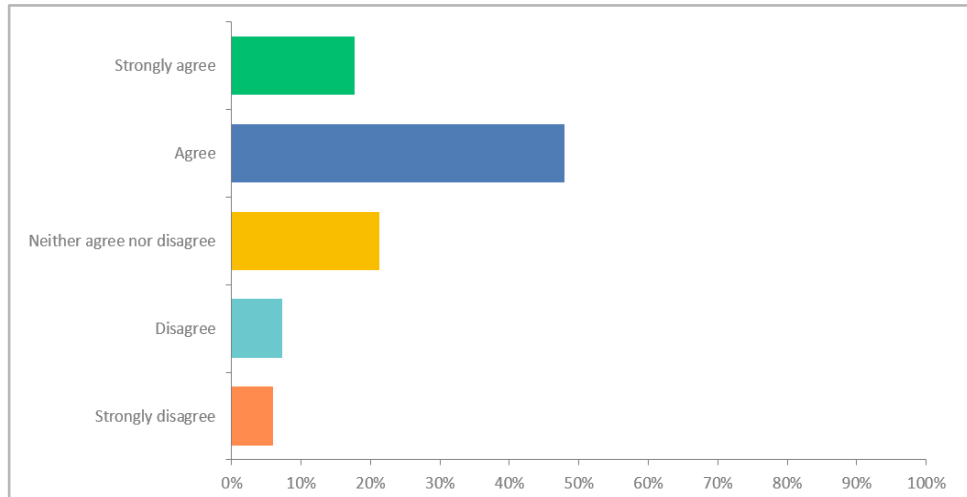
Finally, [Figure 54](#) shows that 81.39% of the teachers also consider that most of the students would learn to play the game very quickly.

- **Accessibility**
- Student evaluation analysis:

This section includes the analysis of the students' opinion on whether the fonts used in the game are easy to read, the voices easy to understand, the colours and sounds meaningful, and the speech speed adequate.

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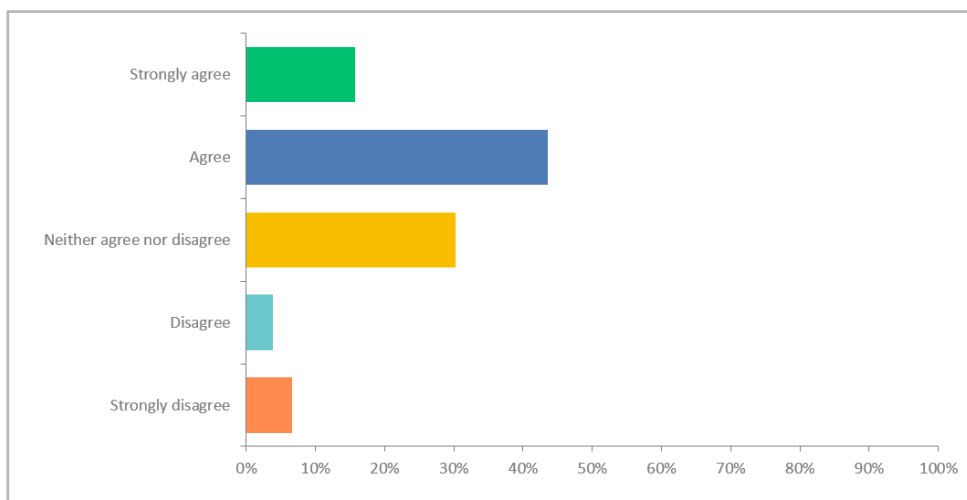
Figure 55: The fonts used in the game are easy to read



Source: [Dig4Life Questionnaire for students]

Figure 55 shows that 65.53% of the students consider that the fonts used in the game are easy to read while 13.19% disagree with this game feature.

Figure 56: The colours used in the game are meaningful

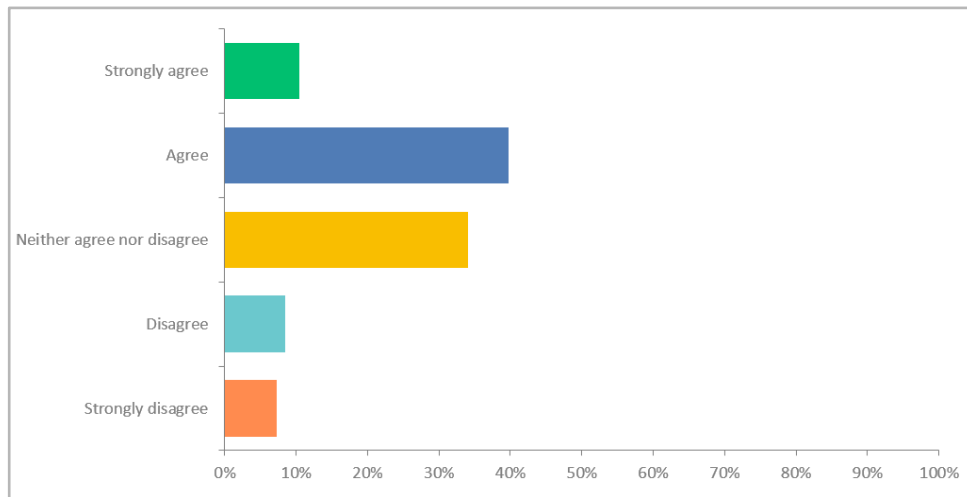


Source: [Dig4Life Questionnaire for students]

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Figure 56 shows that the percentage of students who agree with the statement that the colours of the game are meaningful is 59.36% and the percentage of students who disagree is 10.43%.

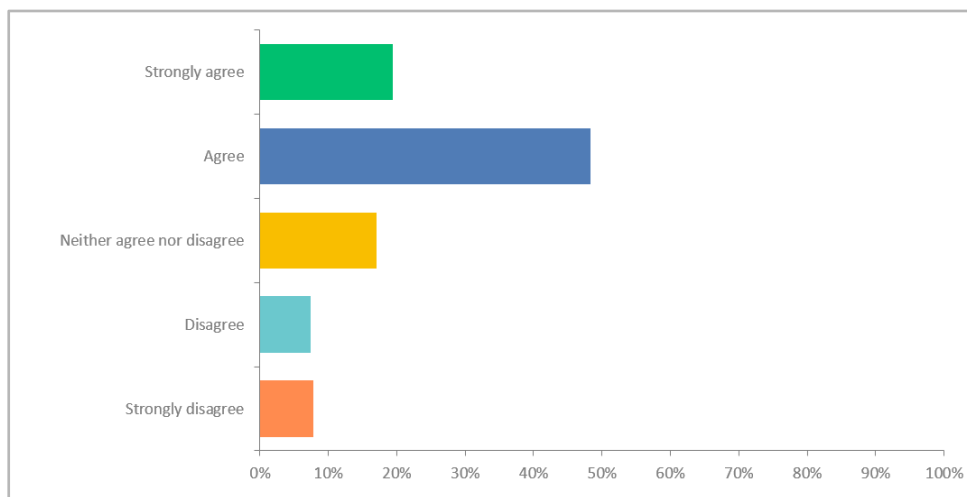
Figure 57: The sounds used in the game are meaningful



Source: [Dig4Life Questionnaire for students]

Figure 57 shows that 50.22% of the students think that the sounds of the game are meaningful. The percentage of students who disagree with this statement is equal to 15.74%. However, the percentage of students who neither agree nor disagree is high 34.04%.

Figure 58: The voices used in the game are easy to understand

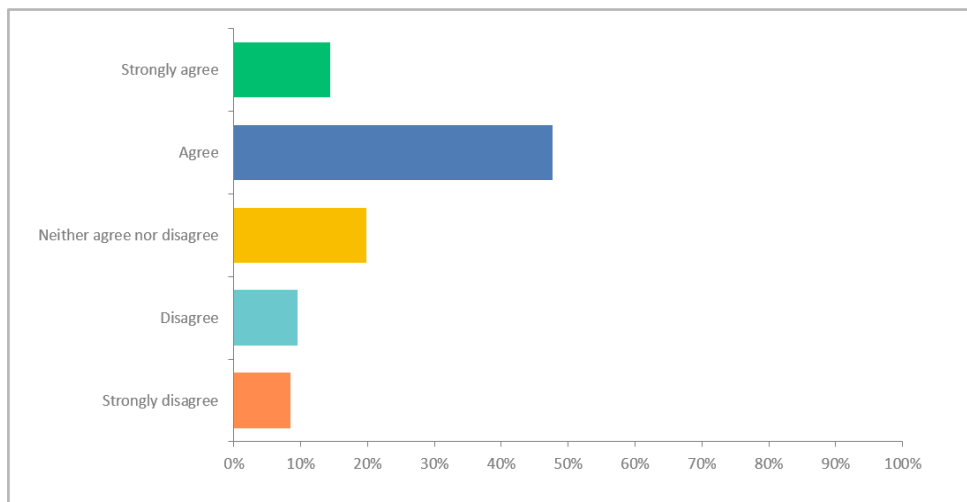


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Source: [Dig4Life Questionnaire for students]

The data represented in [Figure 58](#) indicate that the percentage of students who think the voices are easy to understand is equal to 67.66%. This percentage is 52.34% higher than the percentage of students that consider that the voices are difficult to understand (15.32%).

Figure 59: I found that the speed of the speech was adequate to follow the game



Source: [Dig4Life Questionnaire for students]

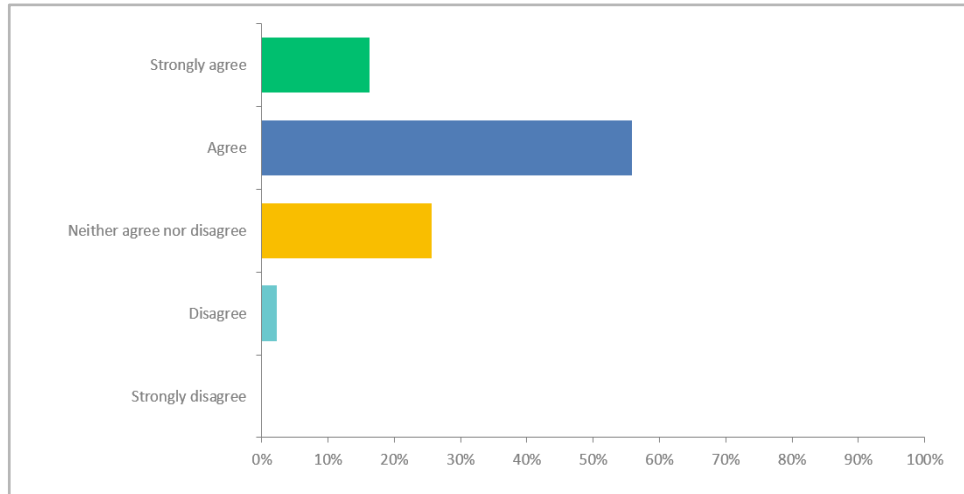
[Figure 59](#) shows the opinion of the students about the speed of the speech. It is observed that 62.40% of the students think that the speed is adequate while only 18.08 % think otherwise.

■ Teacher evaluation analysis:

This section contains the analysis of the teachers' opinion about the same accessibility items previously described and evaluated by the students.

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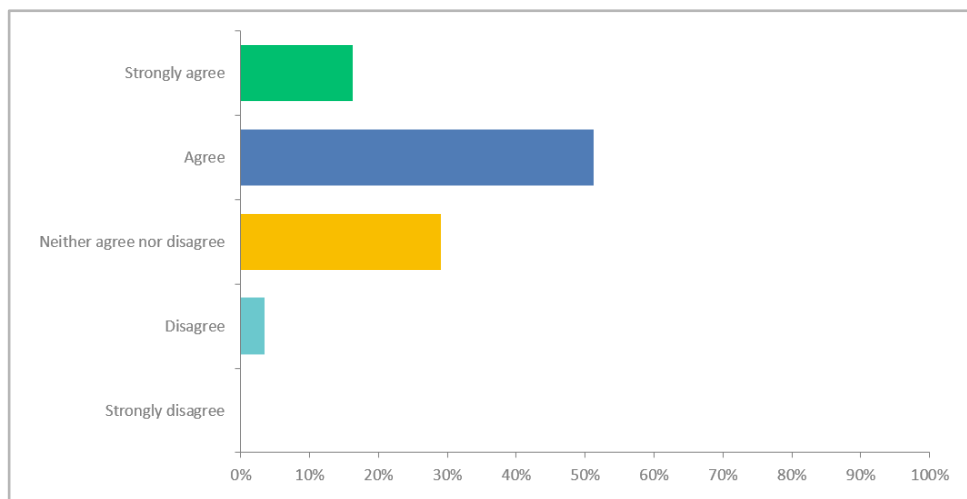
Figure 60: The fonts used in the game are easy to read



Source: [Dig4Life Questionnaire for teachers]

Figure 60 shows that 72.09% of the teachers agree that the fonts used in the game are easy to read and only 2.33% teachers disagree.

Figure 61: The colours used in the game are meaningful

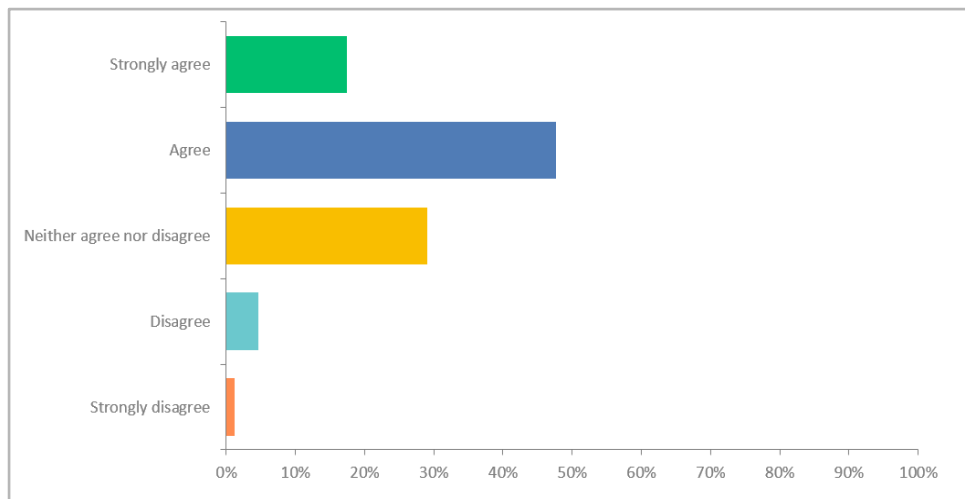


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Source: [Dig4Life Questionnaire for teachers]

Figure 61 shows that although 67.44% of the teachers think the colours are meaningful and 29.07% neither agree nor disagree. Only 3.49% of teachers disagree with that.

Figure 62: The sounds used in the game are meaningful



Source: [Dig4Life Questionnaire for teachers]

The data represented in Figure 62 indicate that a high percentage of the teachers 65.11% think that the sounds are meaningful while only 5.81% of teachers disagree.

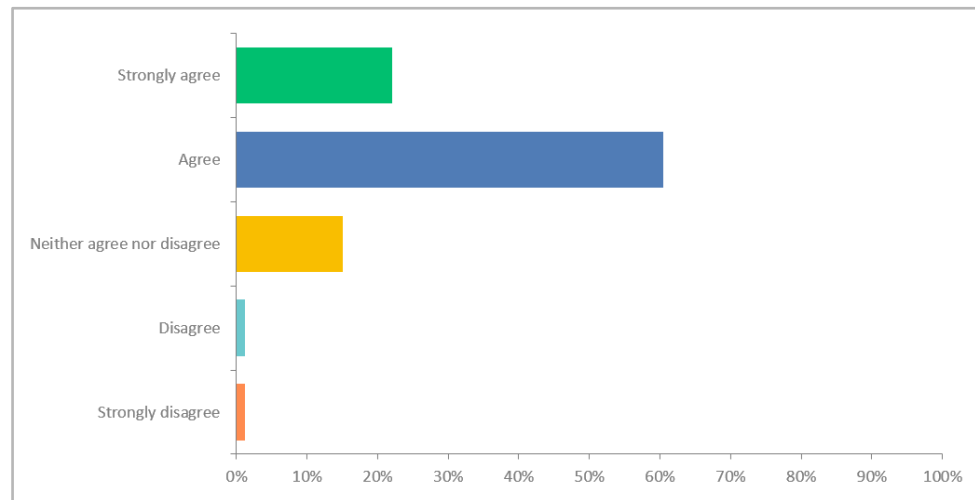
Figure 63: The voices used in the game are easy to understand

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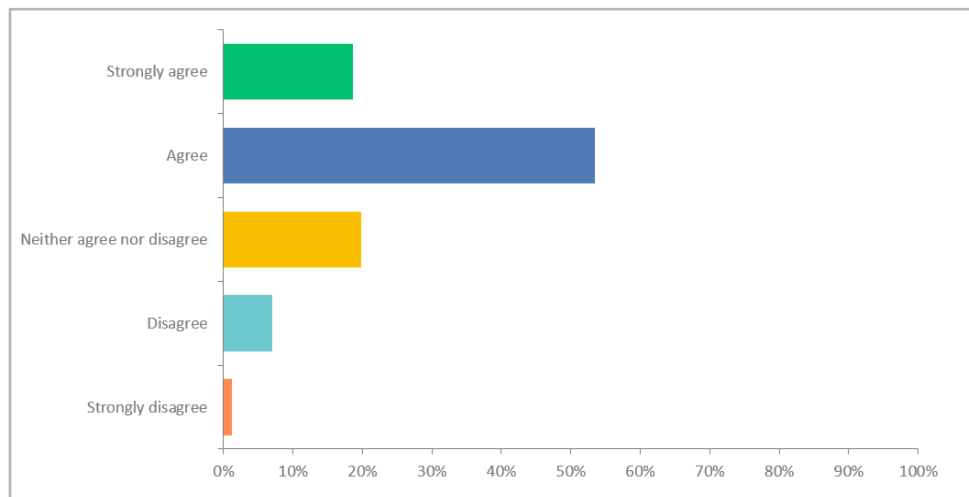
Source: [Dig4Life
Questionnaire for teachers]

Figure 63 shows that 82.56% of the teachers think the voices are easy to understand and only 2.32% disagree.

Figure 64: I found that the speed of the dialogues was adequate to follow the



game



Source: [Dig4Life Questionnaire for teachers]

Finally, Figure 64 represents the teachers' opinion about the speed of the dialogues. It is observed that 72.09% of the teachers think the speed of the speech is adequate while only 8.14% disagree.

■ **Final analysis of usability quality factor**

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After analysing the answers of the items selected to evaluate the different dimensions of the usability quality factor, we can conclude the following:

- *Aesthetics*. It is observed that more than half of students 55.53% think the game design is attractive and 65.75% think that the text font and colours are well blended and consistent. Teachers rated better these two items of the aesthetics dimension better than students. Additionally, 55.81% of the teachers agree the game is attractive and 66.28% consider the text fonts and colours are suitable. This dimension is valued almost equally by students and teachers.
- *Operability*. This dimension is one of the best valued by both students and teachers, although the teachers have rated the game operability higher than students. On the one hand, 70.85% of the students agree the game is easy to play and 73.20% that the game rules are clear and easy to understand. On the other hand, 84.88% of teachers think that the rules of the game are clear and easy to understand. In addition, 74.42% of teachers consider the game easy to play and 72.09% think that it was easy to use in their courses.
- *Learnability*. The percentage of the students who think that it is not necessary to learn a few things to play the game is 43.19% and they reckon that they easily learned to play (72.13%) and that most people would learn to play the game very quickly (63.57%). The percentage of teachers who needed to learn a few things for better understanding of the game is 41.86%, high percentage (79.07%) of teachers learned easy to play the game and 81.39% think that most students would quickly learn to play this game.
- *Accessibility*. The colours are meaningful is rated by the students with 59.36% agree and the voices easy to understand (67.66% agree). Moreover, the percentage of students who agree that the fonts are easy to read is (65.53% agree) and the speed of the speech is adequate (62.13% agree). The lowest rated item by the students regards the meaningfulness of the sounds (50.22% agree). The percentage of teachers who agree with the items of accessibility is higher than the percentage of students who agree with these topics, being the teachers' percentage between 65% and 83%, depending on the item evaluated. Understanding of the voices in the game was highest rated with 82.56% and the meaning of the sounds lowest with 65.11%.

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3.

STRENGTHS, WEAKNESSES, AND SUGGESTIONS FOR IMPROVEMENT

This section contains the analysis of the game strengths and weaknesses, and the suggestions to improve the game that both students and teachers have indicated in the open-ended questions of the evaluation questionnaires.

3.1

Strengths

S

Table 3 collects the feedback received from the participants regarding the strengths found in the game. The comments have been classified according to the quality model used to evaluate the game experiences.

Table 3 will be classified in:

- Table 3.1 feedback received from the participants in Spain-University of Cadiz
- Table 3.2 feedback received from the participants in Austria-FH Joanneum
- Table 3.3 feedback received from the participants in Italy-Link Campus University
- Table 3.4 feedback received from the participants in Finland- Laurea
- Table 3.5 feedback received from the participants in Slovenia-ACADEMIA
- Table 3.6 feedback received from the participants in Lithuania- Klaipeda University

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Table 3.1: Game strengths identified by the participants in Spain - University of Cadiz

Player Experience	Challenge	<ul style="list-style-type: none"> ■ he challenges and questions proposed in the game are suitable for learning digital skills.
	Satisfaction	<ul style="list-style-type: none"> ■ eachers would use the game again in their course and would recommend it to other teachers.
	Focused attention	<ul style="list-style-type: none"> ■ he game storyline is modern and current and captures the attention of the players.
	Fun	<ul style="list-style-type: none"> ■ he game is original, coherent, attractive, entertaining, educational, and interactive. ■ he storyline is very well understood, the dialogues are good and funny, and the characters speak colloquially. ■ he Arci drone makes the storyline more fun.

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	Relevance	<ul style="list-style-type: none"> ■ the game helps to know the steps to follow to perform digital tasks. ■ the game helps students to learn and to use technical language. ■ the use of social networks in the game is very adequate since it is focused on the evaluation and learning of the digital skills of teenagers. ■ the game is interactive and is a good tool for learning digital skills. ■ the feedback provided by the game helps students to know and improve their digital competence level. ■ the game helps to know the students' digital competence level as well as to improve it. ■ the game allows us to evaluate real situations that are related to digital competences. ■ students would recommend the game to their friends. ■ the game takes diversity into account since it includes the non-binary gender in characters.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ the characters, colours, graphics, voices and settings of the game are suitable.
	Learnability	<i>No feedback received for this dimension.</i>
	Operability	<ul style="list-style-type: none"> ■ the game is easy to play, and the game rules are clear.

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	Accessibility	<ul style="list-style-type: none"> ■ he game can be stopped, and the subtitles can be activated.
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Table 3.2: Game strengths identified by the participants in Austria-FH Joanneum University of Applied Sciences

Player Experience	Challenge	<i>No feedback received for this dimension.</i>
	Satisfaction	<i>No feedback received for this dimension.</i>
	Focused attention	<ul style="list-style-type: none"> ■ he game captures the attention of the player.
	Fun	<i>No feedback received for this dimension.</i>
	Relevance	<ul style="list-style-type: none"> ■ he game is an interactive and useful tool for learning digital skills for the younger population (teenagers).
Usability	Aesthetics	<ul style="list-style-type: none"> ■ he colours, voices and sounds of the game are fine.
	Learnability	<ul style="list-style-type: none"> ■ t was easy for students to learn to play this game.
	Operability	<ul style="list-style-type: none"> ■ he game is easy to play.

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	Accessibility	<i>No feedback received for this dimension.</i>
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Table 3.3: Game strengths identified by the participants in Italy-Link Campus University

Player Experience	Challenge	<ul style="list-style-type: none"> ■ strategy factor is well built and important for the achievement of the game objectives. ■ the game is properly challenging.
	Satisfaction	<ul style="list-style-type: none"> ■ the way to relate between character and player is well managed. ■ characters are well built and easy to recognise.
	Focused attention	<ul style="list-style-type: none"> ■ the plot is interesting. ■ the game is engaging
	Fun	<ul style="list-style-type: none"> ■ the plot is well built. ■ game's activities are dynamic and exciting.

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Usability	Relevance	<ul style="list-style-type: none"> ■ The informative content is exhaustive. ■ The variety of topics is a strength. ■ The game is full of learning opportunities and is useful to help students in developing critical thinking.
	Aesthetics	<ul style="list-style-type: none"> ■ Graphics and figures are well built. ■ The game is easy and pleasant to play.
	Operability	<ul style="list-style-type: none"> ■ The game is simple and intuitive to play. ■ The game has a comprehensive use.
	Accessibility	<ul style="list-style-type: none"> ■ The game is well structured, simple and accessible to all. ■ Sounds and colours have a good yield. ■ Voices are not robotic and are easy to listen to.

Table 3.4: Game strengths identified by the participants in Finland-Laurea University of Applied Sciences

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Player Experience	Challenge	<ul style="list-style-type: none"> divide opinions of the students for and against, while the majority of the teachers consider the game challenging for the students.
	Satisfaction	<ul style="list-style-type: none"> the students feel satisfied when completing the game task. The teachers feel satisfied with the things that students become aware of by playing the game and would like to use the game again in their courses.
	Focused attention	<i>No feedback received for this dimension.</i>
	Fun	<i>No feedback received for this dimension.</i>
	Relevance	<ul style="list-style-type: none"> divide opinions of the students for and against
Usability	Aesthetics	<ul style="list-style-type: none"> tudents consider game design attractive
	Learnability	<ul style="list-style-type: none"> game is easy to play and people learn to play it fast.
	Operability	<ul style="list-style-type: none"> game rules are clear and easy to understand. Teachers consider that the game is easy to use in their course.

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	Accessibility	<ul style="list-style-type: none"> ■ The contents are easy to read and voice is easy to understand. The speed of the speech is adequate to follow the game. The sounds are meaningful.
--	----------------------	---

Table 3.5: Game strengths identified by the participants in Slovenia -ACADEMIA

Player Experience	Challenge	<ul style="list-style-type: none"> ■ The game is properly challenging and suitable for learning digital skills.
	Satisfaction	<ul style="list-style-type: none"> ■ Participants were satisfied with the game and would recommend it to their friends.
	Focused attention	<ul style="list-style-type: none"> ■ The game is attractive from the beginning and captures the attention of the players till the end.
	Fun	<ul style="list-style-type: none"> ■ The game is entertaining, activities are dynamic and exciting.
	Relevance	<ul style="list-style-type: none"> ■ The game helps to know the students' digital competence level as well as to improve it.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ The characters, colour, graphics, fonts are well built and suitable. Voices are easy to understand.

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	Operability	<ul style="list-style-type: none"> the game is easy to play, the instructions are clear.
	Accessibility	<ul style="list-style-type: none"> the game is accessible and easy to understand. The speed of the speech is adequate.

Table 3.6: Game strengths identified by the participants in Lithuania -Klaipeda University

Player Experience	Challenge	<ul style="list-style-type: none"> the game is properly challenging and suitable for learning digital skills. It required challenges in solving problems and tasks.
	Satisfaction	<ul style="list-style-type: none"> the game is interesting for younger participants.
	Focused attention	<ul style="list-style-type: none"> the game appeals to the development of critical thinking.
	Fun	<ul style="list-style-type: none"> the game is identified as rather fun.
	Relevance	<ul style="list-style-type: none"> the game helps to know the students' digital competence level as well as to improve it.
Usability	Aesthetics	<ul style="list-style-type: none"> the characters, colour, graphics, fonts are well built and suitable. Voices are easy to understand.

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	Operability	<ul style="list-style-type: none"> ■ he game is easy to play, the instructions are clear.
	Accessibility	<ul style="list-style-type: none"> ■ he game is accessible and easy to understand. The speed of the speech is adequate.

3.2

W

Weaknesses

Table 4 collects the feedback received from the participants regarding the weaknesses found in the game. As above, the comments have been classified according to the quality model used to evaluate the game experiences.

Table 4 will be classified in:

- Table 4.1 feedback received from the participants in Spain-University of Cadiz
- Table 4.2 feedback received from the participants in Austria-FH Joanneum
- Table 4.3 feedback received from the participants in Italy-Link Campus University
- Table 4.4 feedback received from the participants in Finland-Laurea
- Table 4.5 feedback received from the participants in Slovenia-ACADEMIA
- Table 4.6 feedback received from the participants in Lithuania- Klaipeda University

Table 4.1: Game weaknesses identified by the participants in Spain-University of Cadiz

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Player Experience	Challenge	No feedback received for this dimension.
	Satisfaction	No feedback received for this dimension.
	Focused attention	<ul style="list-style-type: none"> ■ the game becomes monotonous and gets boring as it progresses because interesting things don't happen that capture the attention of the players. ■ the episodes are too long and sometimes repetitive. ■ the dialogues of the characters are usually quite long.
	Fun	No feedback received for this dimension.
	Relevance	<ul style="list-style-type: none"> ■ some challenges are complex for the students' digital competence level.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ the game is slow, has no animations and the scenes are repeated quite a lot. For this reason, students get bored playing. ■ the characters are very static, and the players cannot interact with them.
	Learnability	No comments received for this dimension.

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	Operability	<ul style="list-style-type: none"> It is difficult to complete the challenges in which you have to drag and drop texts or order texts. It is not clear how DigiCloud works. If the game crashes for any reason, the data is lost, and players must play again from the beginning. Besides, several challenges are not clearly explained, and it is difficult to understand them.
	Accessibility	<ul style="list-style-type: none"> The voices of the characters are not well understood. Sometimes the texts of the dialogues are not good.

Table 4.2: Game weaknesses identified by the participants in Austria-FH Joanneum

Player Experience	Challenge	<ul style="list-style-type: none"> The game was not challenging enough for the students of higher education institutions.
	Satisfaction	<ul style="list-style-type: none"> It was very difficult to motivate the students to play this game.
	Focused attention	<i>No feedback received for this dimension.</i>
	Fun	<ul style="list-style-type: none"> The game was not interesting enough for the students.

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Usability	Relevance	No feedback received for this dimension.
	Aesthetics	No feedback received for this dimension.
	Learnability	No feedback received for this dimension.
	Operability	<ul style="list-style-type: none"> any students had problems playing the game, it was not possible to play on all browsers. difficult mobile phone handling, although explained, does not work on mobile phones.
	Accessibility	No feedback received for this dimension.

Table 4.3: Game weaknesses identified by the participants in Italy-Link Campus University

Player Experience	Challenge	<ul style="list-style-type: none"> the game is sometimes too simple
	Satisfaction	<ul style="list-style-type: none"> strategy factor not properly satisfying.
	Focused attention	<ul style="list-style-type: none"> it is necessary to improve the player's engagement.
	Fun	No feedback received for this dimension.

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Usability	Relevance	No feedback received for this dimension.
	Aesthetics	No feedback received for this dimension.
	Operability	<ul style="list-style-type: none"> here are some bugs in the game. difficulty understanding the demands of the game. The game should be better explained
	Accessibility	<ul style="list-style-type: none"> sometimes it is difficult to follow the dialogues because of their length.

Table 4.4: Game weaknesses identified by the participants in Finland-Laurea

Player Experience	Challenge	<ul style="list-style-type: none"> divided options of the students for and against
	Satisfaction	No feedback received for this dimension.
	Focused attention	The student did not lose the track of time or forget about the surroundings while playing the game.
	Fun	<ul style="list-style-type: none"> less than half of the students considered having fun while playing the game.

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Usability	Relevance	<ul style="list-style-type: none"> ■ one fourth of the students would not prefer to use the game to find out about their level of digital competence than to use other ways, e.g. survey.
	Aesthetics	<ul style="list-style-type: none"> ■ divided opinions of the teachers for and against.
	Learnability	<i>No feedback received for this dimension.</i>
	Operability	<i>No feedback received for this dimension.</i>
	Accessibility	<i>No feedback received for this dimension.</i>

Table 4.5: Game weaknesses identified by the participants in Slovenia-ACADEMIA

Player Experience	Challenge	<i>No feedback received for this dimension.</i>
	Satisfaction	<i>No feedback received for this dimension.</i>
	Focused attention	In some parts the game is monotonous.
	Fun	<i>No feedback received for this dimension.</i>
	Relevance	<ul style="list-style-type: none"> ■ some challenges are complex for the students' digital competence level.

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Usability	Aesthetics	<ul style="list-style-type: none"> he players cannot interact with the characters.
	Learnability	<i>No feedback received for this dimension.</i>
	Operability	<ul style="list-style-type: none"> here are some bugs in the game. If the game crashes the data is lost and players must start from the beginning.
	Accessibility	<ul style="list-style-type: none"> ometimes it is difficult to follow the dialogues because of their length.

Table 4.6: Game weaknesses identified by the participants in Lithuania-Klaipeda University

Player Experience	Challenge	<ul style="list-style-type: none"> nly a third of the participants see the game as challenging.
	Satisfaction	<ul style="list-style-type: none"> nly a third of the participants express the direct satisfaction
	Focused attention	<ul style="list-style-type: none"> n some parts the game is monotonous, some parts are to long.
	Fun	<ul style="list-style-type: none"> ame could be with more entertainment.
	Relevance	<ul style="list-style-type: none"> ome challenges are complex for the students' digital competence level.
Usability	Aesthetics	<ul style="list-style-type: none"> he players cannot interact with the characters.

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	Learnability	<ul style="list-style-type: none"> participants would like more hands-on training before the game, a demo version of the game rules instead of a long document.
	Operability	<ul style="list-style-type: none"> here are some bugs in the game. If the game crashes the data is lost and players must start from the beginning.
	Accessibility	<ul style="list-style-type: none"> ometimes it is difficult to follow the dialogues because of their length.

3.3

for improvement

S

Table 5 collects the suggestions for improvement received from the participants. Again, the comments have been classified according to the quality model used to evaluate the game experiences.

Table 5 will be classified in:

- Table 5.1 feedback received from the participants in Spain-University of Cadiz
- Table 5.2 feedback received from the participants in Austria-FH Joanneum
- Table 5.3 feedback received from the participants in Italy-Link Campus University
- Table 5.4 feedback received from the participants in Finland-Laurea
- Table 5.5 feedback received from the participants in Slovenia- ACADEMIA
- Table 5.6 feedback received from the participants in Lithuania- Klaipeda University

Table 5.1: Suggestions for improvement proposed by the participants in Spain-University of Cadiz

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Player Experience	Challenge	<ul style="list-style-type: none"> ■ Introduce challenges with activities and questions like those that can be done with applications such as Kahoot, JClic, etc.
	Satisfaction	<i>No feedback received for this dimension.</i>
	Focused attention	<ul style="list-style-type: none"> ■ Add more challenges of different types so that the game does not become monotonous. ■ Include more interesting challenges that capture the students' attention. ■ Maintain the interest in the story throughout the episodes to prevent the student from dropping out.
	Fun	<ul style="list-style-type: none"> ■ Make dialogues funnier. ■ Include more fun minigames to solve the challenges.
	Relevance	<ul style="list-style-type: none"> ■ Do add explanations about the digital competences that are assessed in the game and provide additional resources that help students improve their level of digital skills. ■ Save the challenge solutions provided by the students so that they can learn from their mistakes and set learning goals to improve their digital competences.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ Improve the graphics and character design.

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	Learnability	<i>No feedback received for this dimension.</i>
	Operability	<ul style="list-style-type: none"> ■ explain the challenges better. ■ include clues that help players to solve the challenges. ■ include help about the operation of the applications DigiCloud, DigiApp, etc ■ add options to skip dialogues. ■ add options to go back and forward in the game. ■ avoid that the game does not restart if it freezes. ■ improve the functionalities of dragging and ordering texts in the challenges
	Accessibility	<ul style="list-style-type: none"> ■ enhance subtitles.

Table 5.2: Suggestions for improvement proposed by the participants in Austria-FH Joanneum University of Applied Sciences

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Player Experience	Challenge	<ul style="list-style-type: none"> ■ igher level of the challenges. ■ ake it more challenging for the university students.
	Satisfaction	-No feedback received for this dimension.
	Focused attention	<ul style="list-style-type: none"> ■ ore challenges in the game so that the game does not become monotonous.
	Fun	No feedback received for this dimension.
	Relevance	No feedback received for this dimension.
Usability	Aesthetics	No feedback received for this dimension.
	Learnability	No feedback received for this dimension.
	Operability	<ul style="list-style-type: none"> ■ mprove the practicality of the game for example shorter dialogues.
	Accessibility	No feedback received for this dimension.

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Table 5.3: Suggestions for improvement proposed by the participants in Italy-Link Campus University

Player Experience	Challenge	<i>No feedback received for this dimension.</i>
	Satisfaction	<i>No feedback received for this dimension.</i>
	Focused attention	<ul style="list-style-type: none"> ■ make the game more interesting by inserting some references to pop culture. ■ streamline the episodes. ■ make the game more dynamic and engaging.
	Fun	<ul style="list-style-type: none"> ■ create more interactive parts. ■ improve the “action” factor.
	Relevance	<ul style="list-style-type: none"> ■ change the context, the characters and the actions according to students' age.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ improve the graphics and the animations. ■ improve the movement of the characters

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	Operability	<ul style="list-style-type: none"> ■ correct the bugs.
	Accessibility	<ul style="list-style-type: none"> ■ increase the speed and clarity of dialogues.

Table 5.4: Suggestions for improvement proposed by the participants in Finland-Laurea University of Applied Sciences

Player Experience	Challenge	<ul style="list-style-type: none"> ■ difficulty levels could be added to the game. There should be a progress bar in all sections.
	Satisfaction	<i>No feedback received for this dimension.</i>
	Focused attention	<ul style="list-style-type: none"> ■ text sections should be shorter and the amount of text in multiple choice tasks should be reduced.
	Fun	<ul style="list-style-type: none"> ■ more functional elements could be added to the game to make it less monotonous and more fun.
	Relevance	<i>No feedback received for this dimension.</i>

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Usability	Aesthetics	<ul style="list-style-type: none"> ■ lumsy graphics could be made more modern
	Learnability	<i>No feedback received for this dimension.</i>
	Operability	<ul style="list-style-type: none"> ■ lexibility to move from one weekday to another or within a day could be added.
	Accessibility	<i>No feedback received for this dimension.</i>

Table 5.5: Suggestions for improvement proposed by the participants in Slovenia-ACADEMIA

Player Experience	Challenge	<i>No feedback received for this dimension.</i>
	Satisfaction	<i>No feedback received for this dimension.</i>
	Focused attention	<ul style="list-style-type: none"> ■ reate more interactive parts, so that the game does not become monotonous.

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	Fun	<ul style="list-style-type: none"> ■ make dialogues funnier.
	Relevance	<ul style="list-style-type: none"> ■ provide additional resources that help students improve their level of digital skills.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ improve character design, movement of the character and the animations by inserting some references to pop culture of students.
	Learnability	<i>No feedback received for this dimension.</i>
	Operability	<ul style="list-style-type: none"> ■ correct the bugs.
	Accessibility	<ul style="list-style-type: none"> ■ shorten the dialogues, increase the clarity and change the context according to students' age.

Table 5.6: Suggestions for improvement proposed by the participants in Lithuania-Klaipeda University

Player Experience	Challenge	<ul style="list-style-type: none"> ■ create more challenging tasks, oriented to problem solving to engage older (15-17years old) pupils.
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	Satisfaction	<ul style="list-style-type: none"> ■ reduce the chances of technical glitches and malfunctions in the game
	Focused attention	<ul style="list-style-type: none"> ■ create more interactive parts, so that the game does not become monotonous.
	Fun	<ul style="list-style-type: none"> ■ make dialogues funnier but do not drag the dialogues.
	Relevance	<ul style="list-style-type: none"> ■ provide additional resources that help students improve their level of digital skills.
Usability	Aesthetics	<ul style="list-style-type: none"> ■ graphic design could be more interesting and diverse
	Learnability	<ul style="list-style-type: none"> ■ practical trainings before the game or demo version how to use and play would be relevant.
	Operability	<ul style="list-style-type: none"> ■ correct the bugs.
	Accessibility	<ul style="list-style-type: none"> ■ shorten the dialogues, increase the clarity and change the context according to students' age.

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4.

CONCLUSIONS

This section contains the main conclusions after analysing the data on the results in the evaluation questionnaire. The main purpose of the Dig4Life evaluation questionnaire was to analyse the player experience, usability and feasibility of the implementing the Dig4Life serious game. The results in the player experience quality factor showed that teachers rated various items higher than the students. A very high number of teachers consider this game an appropriate tool for assessing digital competence, as well as many students who agree that this is an adequate tool to become aware of the level of digital competence. Regarding the usability quality factor, the best rated by teachers and students in this section is operability of the game. It is observed that the game rules are easy to understand and as well easy to play and use in the course. Some of the game's strengths listed are that the game is attractive, interactive and educational and very useful as an aid to students in developing critical thinking. Weaknesses instead note that there are bugs in the game, that the game sometimes crashes and data is lost, and therefore has to be played from the beginning. And some of the suggestions for the improvement are to make the game more dynamic, to correct bugs and to create more interactive parts, so that the game does not become monotonous.

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DIG4LIFE Consortium

Università degli studi di Roma 3

Link Campus University; DITES

Italy

Cecilia Costa

Stefania Capogna

Maria Chiara De Angelis

Giulia Cecchini

Giovanni Di Gennaro

Angelo Del Cimmuto

Academia Druzba za Storitve Doo

Slovenia

Daniel Perdiguero

Natalija Žunko

Nina Gaube

Zan Dapcevic

FH Joanneum Gesellschaft MBH

Austria

Maja Dragan

Hagen Helge Hochrinner

Aleksandra Cupac

Entropy Knowledge Network s.r.l.

Italy

Michela Fiorese

Roberto Vardisio

Katia Cedrone

Angela Macri

Vindice Deplano

Cosimo Mandorino

Universidad de Cadiz

Spain

Mercedes Ruiz

Nieves Gómez

Elena Orta

Mariló Gomez

Nuria Hurtado

María Teresa García

Alejandro Calderón

Manuel Trinidad

Klaipėdos Universitetas

Lithuania

Erika Zuperkiene

Ligita Simanskiene

Darius Burgis

Laurea-Ammattikorkeakoulu Oy

Finland

Jaakko Tyni

Annemari Kuhmonen

Tarja Kantola

Pauliina Punnonen

Sini Häyrynen

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