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ORIGINAL ARTICLES AND REVIEWS

An international study of middle school students' preferences about digital interactive education activities for promoting psychological well-being and mental health

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Abstract

Introduction. The present study investigated students' preferences about technology tools and digital education activities to be used in classroom to facilitate the implementation of a mental health promotion program.

Method. Students' preferences have been elicited during one session focus group lasting 60 minutes. Overall, 26 focus groups, facilitated by 33 teachers, were organized in 9 schools of five European countries. Overall, 283 students who attended the first, second and third year of middle school (aged 10-15 years) volunteered to participate in the focus groups.

Results. The majority of preferences indicated smartphone to communicate or to get information and tablet for a better use in classroom. Collaborative games have been considered as more useful and beneficial compared to the other digital educational activities proposed.

Conclusions. Teachers require further insight into the pedagogical role of ICT and training. There is a need to encourage them to provide opportunities to allow students to use technology to solve problems or develop abilities for a better socio-emotional functioning and, ultimately, mental health.

Key words

- psychological well-being
- mental health
- school
- pedagogical tools
- educational ICT tools

INTRODUCTION

Poor mental health in childhood and adolescence is associated with health and social problems such as school failure, delinquency, and substance misuse, and this increases the risk of adverse outcomes in adulthood [1]. World Health Organization (WHO) has estimated that up to 20% of children and adolescents worldwide suffer from a problem of psychological or behavioural development and one in eight suffers from a mental disorder [2]. Interventions that promote positive mental health may provide young people with the necessary life skills, support, and resources to accomplish their potential and to deal with adversity for preventing mental health disorders [3]. Schools are one of the most important communities where young people mental health can be promoted [4, 5]. The literature suggests that mental health promotion programs in schools produce long-term benefits for young people, especially if these programs are conducted as part of school activities and adopt a wider approach, namely, the ones that promote generic psychosocial competence and life skills instead of focusing on specific behavioural prob-

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lems [6-10]. Life skills [11] are psychosocial competencies that help people to be more aware in the process of decision-making, solving problems, thinking critically and creatively, communicating effectively, developing safe relationships, understanding the emotions of others, and managing their lives in a healthy and productive manner.

According to the UNICEF report, computer and communication technologies are now fixtures of youth culture [12]. Modern technology has transformed the experience of growing up of adolescents. For a generation of young people, technology has assumed a substantial stake in their social and educational lives [13]. Teens all over the world are growing up in a world in which the Internet, smartphones, text messaging, television and video games, and other technologies dominate their communication and are an integral part of everyday life. Due to the enormous development of technologies, this era could also be called the Age of Technology [14]. Many educational researchers have affirmed that young people have different learning styles and communication technologies preferences because of their fluency in communication technology skills [15]. Because of this, they urge schools and educators to respond to these students' preferences in ways that may be significant for education. For example, teachers may leverage students' capabilities with technologies to implement these technologies inside the school to be used for disseminating life skills programs finalized to positive mental health youth development.

We here report the findings collected within the framework of the Project "Well-School-Tech", for middle secondary school education, funded by the Erasmus+ Program for School Education. The Projects' European partners were Vilniaus Kolegija, University of Applied Sciences (VIKO), Vilnius (Lithuania); Promimpresa (Italy); Istituto Superiore di Sanità (Italian National Institute of Health), Rome (Italy); University of Lodz, Lodz (Poland); Europa Training, Plymouth (United Kingdom); European Center for Quality, Sofia (Bulgaria). The objectives of the project were: 1) to exchange good practices for mental well-being management in school context, in order to collect methodologies aimed at students' well-being with the direct support of the actors involved in the well-being and learning process of students, i.e. teachers and parents; 2) to provide students with tools to manage mental well-being, improve communication skills, increase self-awareness and problem solving abilities; 3) to produce high quality resources for teachers and professionals and improve their competencies to deal with diversified groups of students, making use of new technologies and learner-centred pedagogical approaches.

With the active participation of the students, the pedagogical methods proposed by partners had to be adapted in multimedia technologies tools (website, video, applications), available in five European languages.

As a one part of the project, the present study has been conducted, with the help of some teachers, in order to provide a comprehensive picture of students' technology experiences and identify the most appropriate multimedia technologies tools for their age group. Specifically, the study aimed to investigate: 1) middle school students' technology experiences inside and outside the school; 2) their preferences about digital education activities to use in classroom, to put into action a structured program aimed at promoting psychological well-being.

For the purpose, the Well-School-Tech Project research team solicited several focus groups, consisting of students, who attended middle secondary schools, to be conducted in all the countries involved in the Well-School-Tech Project.

MATERIALS AND METHODS

Study design and participants

A descriptive qualitative design was employed for this study using a semi-structured focus group interview for data collection.

Several eligible schools were contacted in early 2017. Once contact had been established, each project research team in their own country illustrated the project and the study to students and teachers in each school. Overall, 9 middle lower schools located in Plymouth (UK), Sofia (Bulgaria), Lodz (Poland), Caltanissetta (Italy), and Vilnius (Lithuania) expressed an interest in the study. A designated teacher in each school carefully recruited students who attended the schools from the first, second and third-year of middle school (aged 10-15 years). Overall, 283 students volunteered to participate in the study *(Table 1)*.

All students who consented to participate in the study also consented to attend a focus group interview. Approval for the study and signed written informed consent was obtained from the parents of all the participant students prior to commencement of the focus groups. According to the countries' legislations, this study did not need formal ethical approval because it was an informative cross-sectional purely observational study. In any case, the study was conducted according to the international guidelines and ethical codes of the Belmont Report and the Oviedo Convention. The focus groups were conducted during the 2017-2018 school year between November and December 2017.

Procedure

Information regarding students' preferences about devices and digital education activities were elicited during one session focus group lasting 60 minutes. Overall, 26 focus groups, facilitated by 33 teachers, were organized in the 9 schools which volunteered to participate to the study. Each focus group included a number of students ranging from 8 to 17 years old. Two facilitators conducted each focus group. One facilitator conducted the interview, while the other (called co-facilitator) recorded process notes; specifically, s/he took careful notes of verbal expressions to aid the subsequent data analysis and interpretation. A focus group template was provided to facilitators by the project team at Italian National Institute of Health (Istituto Superiore di Sanità – ISS) to support and facilitate them in the implementation of a standardized methodology to conduct focus groups (*Box 1* and *Box 2*).

The facilitators were equipped with a guide with in-

Table 1
Schools and students involved in the focus groups

	Bulgaria	Lithuania	Poland	United Kingdom	Italy	All Countries
Schools (no.)	1	1	1	5	1	9
Classrooms (no.)	3	4	3	5	5	20
Teachers (no.)	10	4	4	5	10	33
Focus groups (no.)	5	3	8	5	5	26
Gender of students M/F	33/23	20/32	35/28	27/35	28/22	143/140
Age of students						
<11 years	0	19	1	58	0	78
11-12 years	25	12	29	0	35	101
13-14 years	31	0	33	4	15	83
>14 years	0	21	0	0	0	21

formation on how to present these activities to students using practical examples.

At the end of each focus group, the facilitators reviewed records and presented data to their project partner coordinator using a Focus Group Report *(Figure 1)*.

Each project partner coordinator summarized all the reports received by his facilitators using a summary focus group report and sent it to Italian National Institute of Health (ISS).

Two ISS's researchers analysed all the reports coming from all countries independently, to identify emerging key themes, differences, and correspondences in the data. Finally, they drafted and provided a final report to all the project partners.

Data analysis

Analyses were conducted across the whole dataset (all countries). Descriptive analyses on students' preferences were performed considering the five questions that were targeted in the Focus Group Report *(Figure 1)*.

Box 1
Focus group schedule *(for facilitators)*

Opening focus group
- To introduce the focus group, a standard statement is recommended to ensure that each group receives the same information and nothing important is missed out *(see for guideline: Informative statements for opening focus group in Box 2)*.

Introducing the topic of psychological well-being
- Ask students if they have ever heard the word "psychological well-being" or "mental health" and what this could mean to them.
- Allow 5/10 minutes to let students express freely their thoughts.
- Explain that psychological well-being refers to feeling good about themselves and with others (with family and friends), developing self-confidence and self-esteem, being optimistic, being able to solve problems and conflicts, and recognizing emotions in order to avoid stress, aggression, anxiety, or low mood.
  Mental health does not mean only suffering from a mental illness. Everyone needs to take care of his mental health, in the same way that people need to take care of their physical health. Mental health is about being emotionally "healthy" and does not always refer to someone with a mental "illness".

Discussing about electronic devices and choice of the favorite one
- Ask students the following questions, and please, be informed about the devices available in your school:
  - Which devices do you usually like to communicate or get information (laptop, smartphone or tablet)?
  - Which devices do you think is better for use in classroom to acquire some new skills for improving your psychological well-being?
- Allow 10/15 minutes to let students express freely their thoughts.
- Accurately transcribe all individual contributions to the focus group interview.
- Write on Focus Group Report the electronic devices chosen by students (register all the comments and if there is a consensus or not on the electronic devices that students prefer).

Discussing about digital interactive educational activities
- Introduce and make examples for each digital interactive educational activity *(see the list of activities in Box 3)*
- Ask students the following questions, for example:
  - Which activity would you like?
  - Which activity do you think would be useful to improve your psychological well-being?
  - Do you think that a specific activity among those listed can be more beneficial than others?
- Allow 15/20 minutes to let students express freely their thoughts.
- Accurately transcribe all individual contributions to the focus group interview.
- Write on Focus Group Report the digital education activities that students choice (register all the comments and if there is a consensus or not on the activity that students prefer).

Box 2
Informative statements for opening focus group *(for facilitators)*

- Welcome to the focus group for students. You are invited here together with other students to discuss the use of digital resources for educational purposes at school. Today's work is part of a bigger project that develops and examines a school-based programme, which will be used by teachers in schools to promote students' psychological well-being.
- Part of the project involves developing ideas for the inclusion of digital interactive educational activities in this programme to see how well they work in school settings.
- Today we will ask your opinion on the relevance, usefulness and effectiveness of some educational activities that should be used for learning skills that may enable students to better deal with everyday life and to cope with life stress.
- We are interested in your opinions. As such there are no wrong answers, there are only your opinions about digital resources, which one of them you like more, or you think could work better, etc. The aim of this focus group is to gather suggestions from you in order to better understand what we need to develop further in the program and what does not need to be changed. Please speak freely and allow others to speak freely too.
- We treat these focus groups and the data collected as confidential. We would like to record these focus groups, mainly through notes and through digital recordings. We will keep them safely and only the transcriptionist and myself will listen to them.
- Is everything clear or is there anything important I have missed?

This template provided the facilitators with information and guidance to open focus groups, introduce the topic of psychological well-being and encourage students to talk openly about their opinions, experiences and preferences, using predetermined interview questions. These included questions that facilitators answered to achieve a comprehensive assessment of students' preferences for 8 interactive educational digital supported activities (*see the list in Box 3*).

Results are reports with frequencies and percentages. Chi-square test was used to compare countries for students' choices about devices.

RESULTS

Data in *Table 2* show that the majority of preferences concerned smartphone (61%) as the device students like more for communicating or getting information, while for a better use in classroom, about 54% of preferences pertained to tablet.

With regard to communicating or getting information, there were differences in the students' preferences among countries (2-sided chi-square: 77 323; df = 8; $p < 0.001$), in particular among Poland, Bulgaria and UK. In fact, Polish and Bulgarian youth declared to not completely prefer laptop/computer for communicating and getting information. In Poland also tablet was not popular to this aim. On the contrary, UK students preferred more tablet than other devices.

Also with regard to the use of devices in classroom, there were differences in the students' preferences among countries (2-sided chi-square: 114 389; df = 8; $p < 0.001$). In fact, youth from Bulgaria and Italy did not completely choose smartphone, while it was the most

Session Date ..... **Country** ..... **School name** ..... **Facilitator name** ..... **Co-facilitator name** ..... **Classroom**		**Age group (years)**: < 11 ☐ 11-12 ☐ 13-14 ☐ > 14 ☐ **Participating students no.** ☐☐ **Male students no.** ☐☐ **Female students no.** ☐☐
Students' choices		
	Device *(one or more choices)*	
Which devices do you usually like to communicate or get information (laptop, smartphone or tablet)?		
Which device do you think is better for use in classroom to acquire some new technical skills for improving your psychological well-being?		
	Digital education activity *(one or more choices)*	
Which activity would you like?		
Which activity do you think would be useful to improve your psychological well-being?		
Do you think that a specific activity among those listed can be more beneficial than others?		

Figure 1
Focus Group Report (Edited by facilitators and/or co-facilitators).

Box 3
The interactive educational digital supported activities presented to students

1. Collaborative games/solution to find
2. Role play
3. Score/competition
4. Online videos (already existing resources) about addressed subjects
5. Story with multiple choices and solutions
6. Interactive exercices/multiple choice test
7. Task based approach/mission to accomplish/objective to achieve
8. Questions/survey

popular device for Polish and Lithuanian adolescents. Similarly to Bulgarian and Italian youth, UK youth declared to prefer more tablet or laptop/computer than smartphone.

With regard to the preferences for digital interactive educational activities that students liked, about 29% concerned online videos. A very high percentage of preferences for activities that students thought useful pertained to collaborative games (46%). With regard usefulness, overall, there were no remarkable differences in the students' major preference among the different countries involved, except for Lithuanian students who thought useful collaborative games as much as online videos.

Among the preferences for activities that students thought more beneficial than others, the higher percentage (about 40%) also concerned collaborative games. Although collaborative games received overall the largest preference with regard to beneficial effects, comparison among the different countries showed that there were some differences. In fact, for Italian and Lithuanian students they did not represent the major choice. These students more frequently indicated as preferable role-play, multiple choice test (Italy) and competition and online videos (Lithuania) *(Table 3)*.

Overall, collaborative games were considered by students as more useful and also beneficial compared to the other activities proposed.

DISCUSSION AND CONCLUSIONS

In 2001, Mark Prensky, an American media researcher and author of computer games, introduced the terms *digital natives* and *digital emigrants* [16]. Not without a reason, these terms are more and more often cited in the works dealing with the issues of modern technologies in the educational context. *Digital natives* in contact with information technologies are like native speakers speaking their mother tongue. They are able to move naturally in the Internet environment, operate a computer and various mobile devices. Such constant access to the Internet and communication channels, or mobile phones, of course may carry certain risks [17-20], but they are not the subject of current study.

There is no doubt that the participants of our research were *digital natives* – a generation of children born and grown up in the world of digital technologies. They are 21st-century students who no longer want to use only traditional teaching methods but recognize smartphones, computers and laptops as powerful tools for transforming learning.

The predominance of the smartphone as a communication and information tool among the vast majority of surveyed students in the present study probably is the result of the trend in the development of smartphones: increasing technical capabilities of devices, faster access to the Internet, and most of all – their commonness. It has to be noted however that there were some differ-

Table 2
Students' choices about devices (because students could indicate 1 or more options the sum is not equal to 283)

Devices that students like for communicating or getting information	Smartphone	Tablet	Laptop/Computer
Bulgaria	56	16	0
Poland	44	0	0
Italy	40	18	18
United Kingdom	17	27	18
Lithuania	29	14	9
Total	**186**	**75**	**45**
Devices that students think are better for use in classroom	**Smartphone**	**Tablet**	**Laptop/Computer**
Bulgaria	0	36	20
Poland	42	54	0
Italy	0	24	21
United Kingdom	3	38	21
Lithuania	26	17	9
Total	**71**	**169**	**71**

Table 3
Students' choices about digital education activities (because students could indicate 1 or more options the sum is not equal to 283)

	Collaborative game	Role-play	Competition	Online videos	Story with multiple choices	Multiple choice test	Task based approach	Questions
				Activities that students like				
Bulgaria	0	16	20	36	0	20	40	0
Poland	0	19	17	39	0	37	39	0
Italy	12	2	7	12	0	13	0	0
UK	3	11	16	20	6	4	2	0
Lithuania	14	3	8	20	0	3	4	0
Total	**29**	**51**	**68**	**127**	**6**	**77**	**85**	**0**
				Activities that students think useful				
Bulgaria	56	0	0	0	0	36	20	0
Poland	44	16	0	0	0	10	18	0
Italy	22	6	2	9	1	1	0	2
UK	25	8	3	7	5	5	7	4
Lithuania	16	3	8	14	0	4	1	2
Total	**163**	**33**	**13**	**30**	**6**	**56**	**46**	**8**
				Activities that students think more beneficial than others				
Bulgaria	56	0	0	0	20	0	20	36
Poland	44	16	0	0	0	10	0	0
Italy	4	19	0	2	2	10	0	0
UK	20	10	6	11	3	3	3	6
Lithuania	8	7	11	13	0	7	4	2
Total	**132**	**52**	**17**	**26**	**5**	**30**	**27**	**44**

ences among countries given that the data obtained in the UK suggest that UK students preferred tablets.

In 2016, Digital Virgo and Comecode, in cooperation with the Mobile Institute, conducted the first study in Poland dedicated to children up to 14 years of age in the mobile world. The results, published in the report SmartKids [21], are quite consistent with the results of the present study. In fact, out of 714 parents taking part in that survey, as many as 82% of them confirmed the use of mobile devices by their children. The study also showed that 1/4 children use their own devices, 52% use parents' smartphones or tablets, and 48% use their own or shared with parents. A study conducted on Italian students also showed that smartphones and tablets are the most frequently used devices (51% and 44% respectively) [22]. Another study which involved almost 3500 participants from seven European countries (Belgium, Denmark, Ireland, Italy, Portugal, Romania and the United Kingdom), reported that about 46% of children aged 9-16 years was a smartphone's owner [23]. A study conducted in USA on over 4500 parents of children in primary and middle secondary schools reported that about 45% of children aged 10-12 years had their own smartphone [24]. Moreover, on average, US teens aged 13-18 engage with screen media (from watching television or online videos to reading online and using social media) for more than 6.5 hours each day; and mobile devices account for almost half this time [25].

It seems that the smartphone is the most familiar device for the youngest users, followed by tablets. There may be a feedback relationship, the majority of children and adolescents want to use a smartphone as a communication and information search tool because most often they use it to communicate with others and surf the Internet.

In the present study, it is interesting to note that Polish and Bulgarian students did not at all indicate the laptop or home computer as a useful device for communicating or searching for information. According to the Concise Statistical Yearbook of Poland [26] on 8000 households, nearly 80% are in possession of a computer (or laptop), thus it is difficult to explain its low popularity among school youth. We are rather inclined to assume that the smartphone, as more "handy", seems to be more attractive to young people. Also a hypothesis about gender differences seems to be worth further exploration. For example, in a study conducted by Sozio *et al.* [27], Brazilian girls will be more likely to use mobile phones than boys (54% and 50%, respectively) and this trend was also observed in other Countries,

for example in Hungary [28] and Japan [29]. This is not consistent with the results of the present study in which, as previously said, smartphone represented the preferred communication and information tool across all surveyed students, except UK students, who had a preponderance of female compared to male students. At the same time, it should be noted that there was a preponderance of female students also in Lithuanian sample of students, however, in this latter case, similarly to Brazil, Japan and Hungary, the main choice was the smartphone, although to a lesser extent to the other Countries surveyed in the present study.

A recent Polish research conducted in 2017 among a representative sample of teenagers [30] (named Teenagers 3.0 report) shows that Polish female teenagers use the Internet more often and intensive than boys, both at home, on the way from home to school, with friends, and in public places, where Wi-Fi is available. Mobile technology allows them to use Internet anywhere and anytime. The average time that Polish girls spend in Internet connection with a smartphone is 211.5 minutes daily, for boys – 165.2 minutes. However, boys use their computer and game console more often. The authors explain these results by the fact that girls use smartphone conveniently for maintaining social relationships more than boys do, while boys more often play online games, for which a desktop computer is more suitable [30]. These differences seem to be worth further exploration because they also concern adult women and men. According to the studies of Andone *et al.* [31] female use smartphones for longer than male adults, with a daily mean of 166.78 minutes vs. 154.26 minutes.

At the same time, not consistently with these results, another study on Polish primary school students showed that among teenagers (11-14 years), 14.3% of boys would like to use smartphones also during lessons and only 2.9% of girls would do it. The opposite situation has been recorded in the case of the preference to use tablets instead of traditional textbooks – 17.1% of girls and 3.6% of boys declared it [32]. The results of the Teenagers 3.0 report [30] help us to better understand differences in the use of information and communication technologies (ICT) by gender. For example, boys more often than girls enjoy or want to use the Internet to improve knowledge for academic purposes while girls to read and/or run blogs, contact friends and search social networking sites. Among girls, the Internet use with social purposes is usually inappropriate during school lessons, hence perhaps their lower attitude towards the use of smartphone in classroom compared to boys.

Interestingly, in the present study, despite the abovementioned primacy of smartphone, about 54% of preferences pertained to tablet as a better tool to use in the classroom. This is not entirely consistent with the results of other Polish studies on the use of modern technologies in secondary school. In fact, Plebańska and Halska [33] reported that among the technologies mentioned by young Polish students as the most commonly used in classroom, an interactive whiteboard took the first place, and on the second place there was a laptop/computer. Smartphones, tablets and mobile applications were much less frequently mentioned by students, although their presence indicated a certain tendency to change. This might be due to lack of confidence in facilitating students to use these tools, some teachers not recognizing the educational value of these type of technologies, or school policy not allowing them to use these types of technologies [34]. Various factors may influence the generation gap between teachers and students in classrooms, i.e., teacher's perceptions and opinions on technology, the requirement to update pedagogy with a focus on technology, the availability of professional training for integrating technology effectively in school [35]. Many teachers are not experts in a broad array of technological tools and they are not comfortable allowing students to independently build their knowledge using technology [36]. While, usually, students think that computers, laptops, smartphones, iPods, videos, interactive whiteboards or Internet are technological tools to be used in classroom, teachers are slower to embrace new forms of technology. Teachers' inexperience may generate a resistance to change, which in turn may affect their interest in training for using technology as educational tool in classroom. Teachers require insight into the pedagogical role of ICT and training, in order to use it in their educational activity. According to recent research [37] teachers who carried out a ICT course are more effective in teaching by using technology tools as opposed to those that have no accomplished such training. A school in Ireland reported that teachers who did not acquire sufficient confidence with technology tools avoided using ICT. Consistently, some teachers in Canada confessed they were reluctant ICT users because they worried they might make a bad impression to students who knew more about technology than they did [38].

Nevertheless, the accelerated expansion of digital technologies has provided interesting perspectives in the educational landscape allowing innovation to take place in the education space. Approaches such as Modern Classrooms [39] or Future Classrooms [40] appear concepts that have been gaining prominence in the European educational context. They integrate the idea that nowadays classrooms must be seen as a learning laboratory, equipped with different new technology and materials, that enables the development of active learning activities, where autonomy and collaboration happen in a daily basis for each and every student. Using new technologies in the classroom can be a way to create positive education. The goal of positive education is to produce both well-being as well as to forward the traditional outcomes of schooling. Using the most popular ICT and devices, teachers can transmit optimism, trust, and a hopeful sense of the future, which will positively influence their students' perception of the world [41]. In the process of digital education activities such as collaborative games, role-play, online videos or task based approach and choices tests, students improve their individual skills; for example students can improve their decision-making by learning how to choose the best action plans from available options [42].

However, there are some barriers in implementing new technologies in the classroom to assist individual skills development. This might be due partially to the

fact that school related tasks currently require students to use technology only for searching information and writing papers. More rarely, teachers provide opportunities to allow students to use technology to solve problems or develop abilities for a better social and emotional functioning. The importance of integrating technology into the classroom has become a priority at most levels of the curriculum in many countries around the world. However, as said, teachers are generally time poor and often have limited knowledge in using technology for solving students' academic or psychosocial problems [43, 44]. This explains why they usually did not employ innovative pedagogical practices in their technology integration [34]. One of the helpful approaches would be peer-to-peer learning and support for teachers. For example, Lang [45] suggests a model of pedagogy of outreach – integrating knowledge of ICT teachers, generalist teachers, and students in the classroom. There is a need to encourage teachers to integrate technology for digital education activities to develop students' productivity as well as their emotional and social abilities [46].

The next stage of Well-School-Tech Project was to put into action a structured program aimed at promoting psychological well-being making use of technology and digital education activities. The programme for promoting psychological well-being and mental health focused mainly on teaching skills that enable students to cope satisfactorily with stress in their life and was inspired by Goleman's emotional intelligence model [47]. Goleman's model identified five domains of emotional intelligence: i) knowing your emotions; ii) managing your own emotions; iii) using emotions to motivate yourself; iv) recognising emotions of other people; v) managing relationships. The main contents of the program address skills such as defining personal goals, adopting effective communication skills, using negotiation, coping with stress, coping with anger, and resolving conflict. In the project, we designed some Internet-based digital education activities for enhancing the above mentioned skills and in the present study we assessed students' opinions on acceptability and usefulness of these activities. Among them, our findings show that students for the most part considered collaborative games as more useful and beneficial compared to the other activities proposed. According to Griffiths [48], gaming gets educational benefits not only in terms of entertainment value but also in increasing skills. Cecilia *et al.* [49] who have analysed the influence of gaming activities on cognitive performance of children found that the technological exposition in childhood enhanced learning, the autonomy in the use of technological tools and/or application represents a good practice to improve the learning abilities in developmental age.

The presented analyses are not free from limitations. First, the study design called for allowing students to provide *one or more choices* for questions regarding the choice of the preferred devices and for digital education activities. The results showed that indeed the majority of students from Bulgaria, Poland and Italy opted for more than one choice while UK and Lithuanian students, in the majority of cases, only opted for one single choice. Therefore, there was likelihood that some students did not understand the request or that the request to provide one or more choices was not enough emphasised in UK and Lithuania. Second, for the statistical analyses, the ISS did not have available individual data of the students; that is why it was not able to associate each choice or preference with the gender of student who expressed that choice or preference. In fact, the facilitators reviewed records and presented aggregate data to their project partner coordinator using a Focus Group summary Report *(Fig. 1)*. In this Report, facilitators only reported the total number of male and female students. Third, students represented by individual countries are not highly numerous, this does not allow us to draw universal conclusions, but we hope that it will contribute to further exploration of the topic.

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Authors' contributions

AG: study design, focus group analysis, statistical data analysis, literature analysis, draft and final revision of the manuscript. GP: study design, focus group analysis, collaboration to the preparation of manuscript, literature analysis. MZ-C: data collection, data interpretation, collaboration to the preparation and revision of manuscript, literature analysis. IC: focus group analysis, literature analysis. DDR: focus group analysis, literature analysis. KK: data collection, data interpretation, collaboration to the preparation and final revision of the manuscript, literature analysis.

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Declarations

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Conflicts of interest statement

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