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Comune di Santarcangelo di Romagna

ADAPT4FUTURE: ADULT PEOPLE CREATE TECHNOLOGIES FOR THEIR FUTURE

No. 2021-1-LT01-KA220-ADU-000026995

EX-POST RESEARCH

ON THE DEVELOPMENT OF DIGITAL, TECHNOLOGICAL, CREATIVE, PERSONAL, SOCIAL AND PROFESSIONAL SKILLS OF THE LEARNERS WHO ATTENDED 3D PRINTING WORKSHOPS

REPORT

2023

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INTRODUCTION

Teaching 3D printing and related topics are in line with the concept of lifelong learning as it not only improves social inclusion and personal development of skills, but also self-sufficiency, as well as competitiveness and employability. A survey published by the University of Massachusetts (2017) on the impact of 3D projects on students' learning has shown that they have developed a range of skills, including not only 3D modelling and technological literacy, but also the so-called soft skills, such as creativity, problem-solving, self-learning, the development of critical thinking and perseverance. Comparisons made between the above skills and the skills spread throughout the 21st century suggest that 3D projects are a promising approach to preparing people for the digital age.

ADaPT4Future project aimed to develop and improve digital, technological, creative, personal, social, and occupational skills of participants during 3D printing workshops based on the methodology of Design Thinking.

3D workshops were delivered by the four project partners (*ROBOTIKOS MOKYKLA-LT, KAUNO MIESTO SAVIVALDYBĖS VINCO KUDIRKOS VIEŠOJI BIBLIOTEKA-LT, NOVA FOUNDATION-PL, and MUNICIPALITY OF SANTARCANGELO – IT)* in the following countries: Lithuania, Poland, and Italy.

The aim of this research was to assess the impact of the 3D learning activities on the participant skill improvement and the application of gained knowledge in real life.

METHODOLOGY

The research methodology has been based on two phases (Phase 1 and Phase 2) which took place respectively 2 and 3 months after the end of the local workshops carried out within the project.

PHASE 1

The research involved about 50% of participants of the local workshops through a blind questionnaire prepared via a Google Form with closed-ended questions. The total number of participants in local workshops is about 200 people, and therefore for phase 1 of the ex-post research 100 participants have been involved (around 25 participants from by each project partner). This activity has been implemented 2 months after the end of the local workshops.

PHASE 2

Among the participants who took part to the phase 1, a sample has been selected on voluntary basis to expand the field of evaluation with some open questions through direct interviews. This activity has been implemented 3 months after conclusion of the learning activities involving a total number of 25 participants (5 people interviewed by each project partner).

The number of respondents reached for phase 1 corresponds to the 50% of the total workshop participants and phase 2 (25% of the total workshops participants) is sufficiently representative to weight their responses and therefore draft some conclusions on the overall impact of the 3D printing workshops on the related participants.

PHASE 1 RESPONSES

- **PARTICIPANTS' GENDER**

  About 60% of respondents were females and significant differences can be found regarding the gender composition of the participants aggregating these data per country. Indeed, if we are going to analyze these data, we can see that in Italy most participants were males (60% participants). In Poland instead, the 60% of the participants were females and in Lithuania females were the 72% of the participants. We must take into consideration that on the overall number of participants, participants in Lithuania were the majority because two of project partners are based in Lithuania. Nevertheless, it is possible to say that in Italy the involvement of female participants has been significantly lower (-20%) compared to Poland and Lithuania.

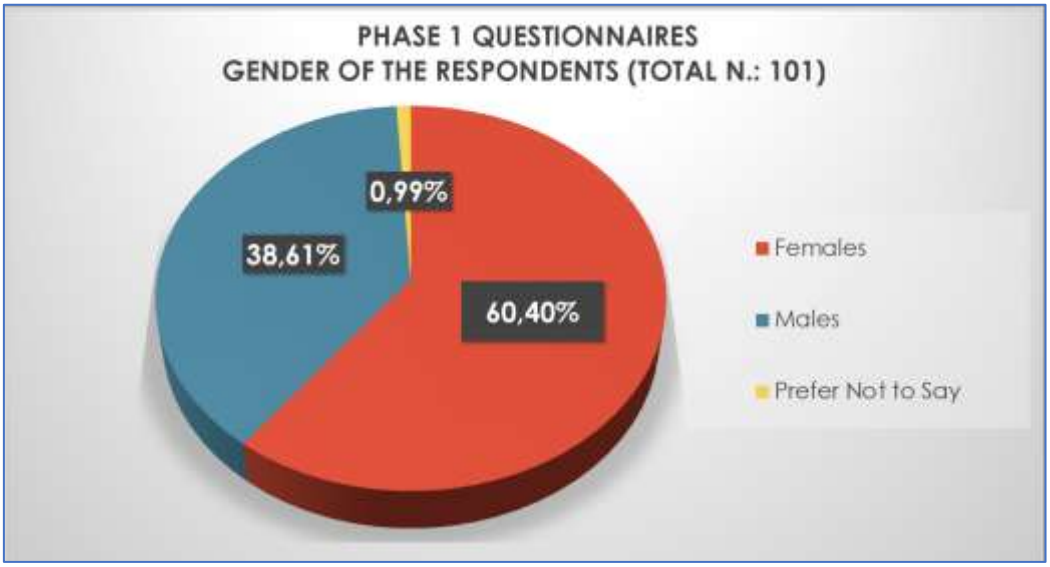

Fig.1

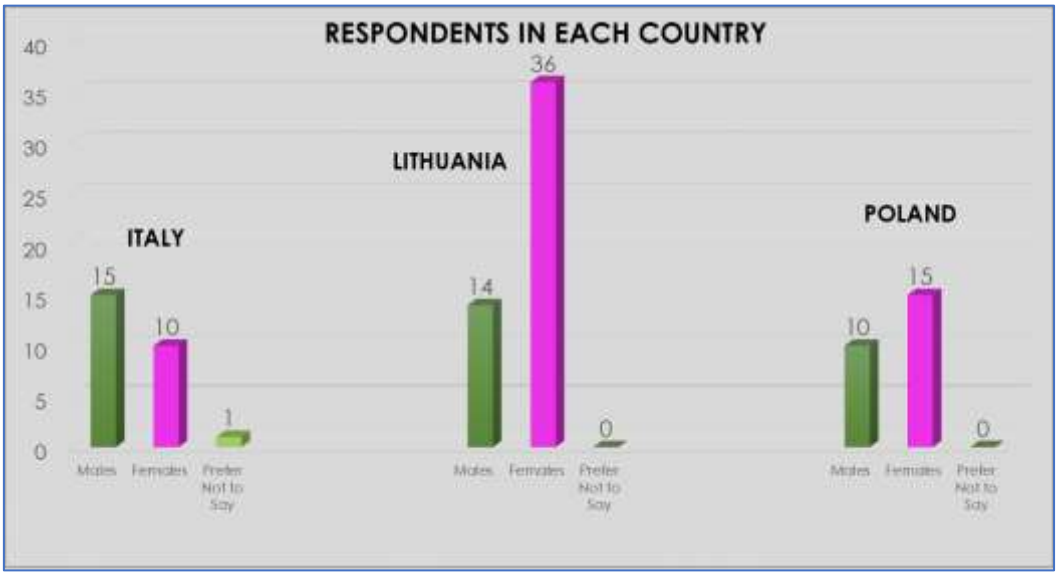

Fig.2

- **AGE**

The top 5 of the respondents age groups is the following:

- 35-39 years old (around 18% of respondents);
- 55-59 years old (around 15% of respondents);
- 30-34 years old (around 15% of respondents);
- 40-44 years old (around 14% of respondents);
- 18-24 years old (around 11% of respondents).

It is important to underline that a significant number of participants in Poland came from groups of people between 60 and 79 years old (about 10% of the overall number), since that the activities of Nova Foundation (Poland) are aimed to elders, in line with its mission.

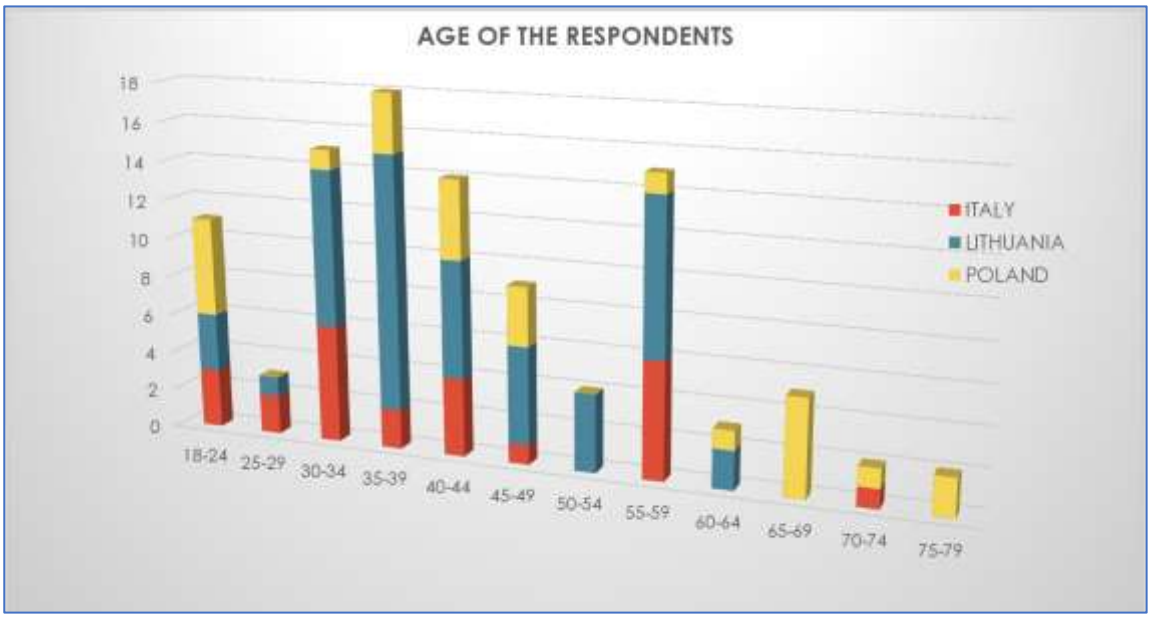

Fig. 3

- **LEVEL OF EDUCATION**

  As shown in the figure 4, most participants had an MA degree (43% of the total number of participants). It is interesting to note also that in Lithuania, 19% of participants held a BA Degree compared to 5% of participants with same level of education in Italy and in Poland. Therefore, considering that two project partners were from Lithuania, one from Italy and one from Poland, this difference has to be weighted, and therefore it is possible to affirm that Lithuania had about 9% more of participants with a BA degree compared to Italy and Poland.

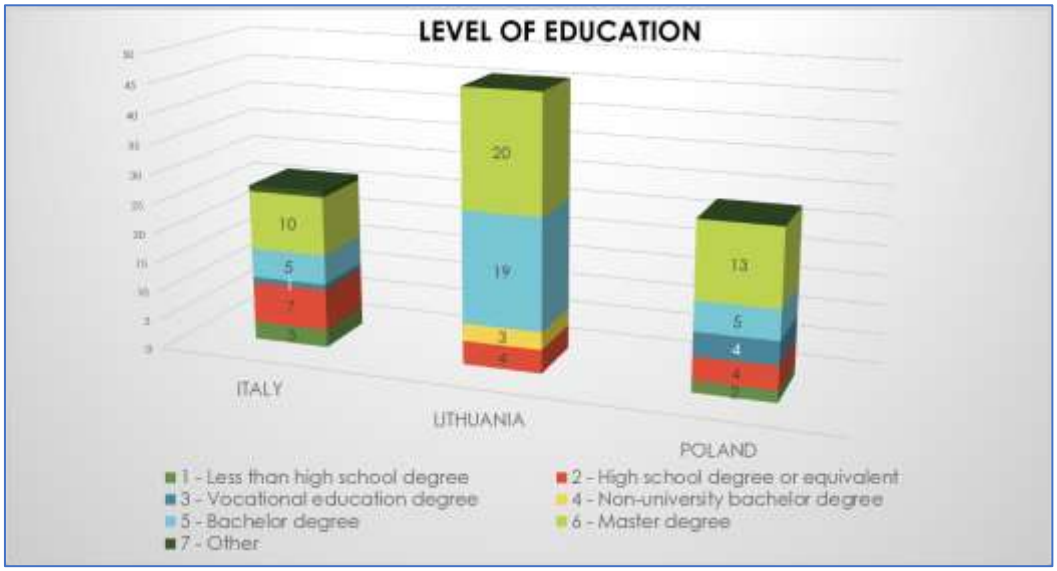

Fig.4

- **EMPLOYMENT STATUS**

  As shown in the figure 5, about 62% of participants were employed full time and about 7% were employed part-time. Unemployed participants were about 15%, with 5% of them that can be classified as NEET (Not engaged in Education, Employment or Training). It is interesting to that the majority of the retired people who took part to the workshops, came from Poland, as explained above.

Fig.5

- **MIGRANT BACKGROUND**

  Regarding composition of the participants, it is interesting to note that about 25% of them had a migrant background and they took part mainly to the workshops in Lithuania (17,8% of the total number of respondents) and in Poland as well (6,9% of the total number of respondents)

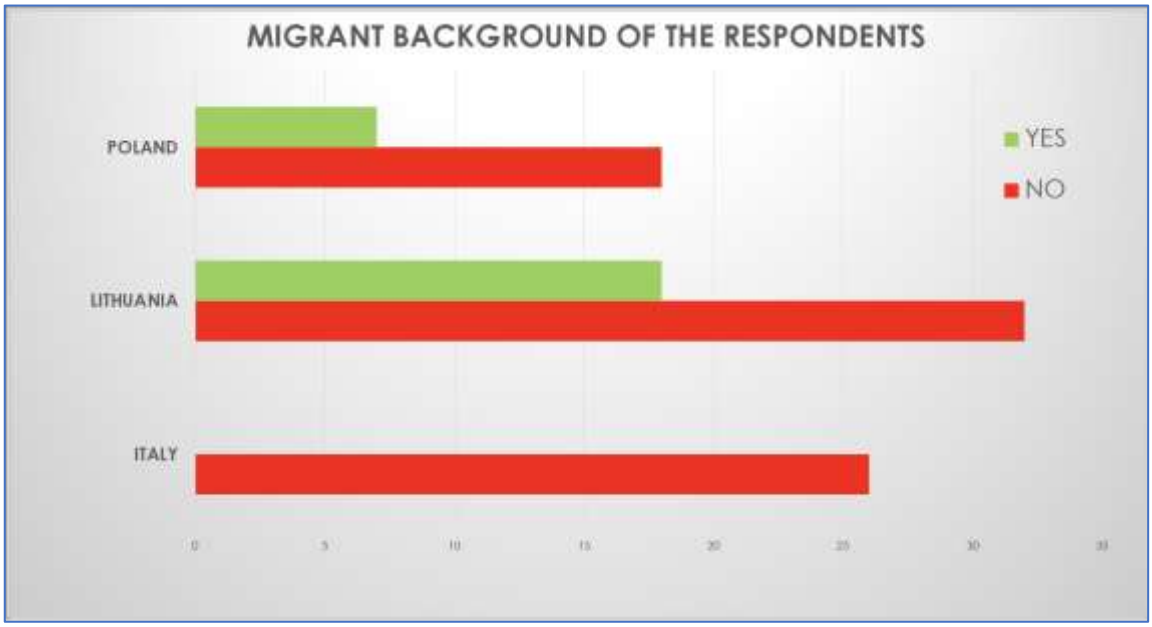

Fig. 6

- **ACQUIRED SKILLS USEFULNESS**

  Regarding this issue, is it possible to affirm that 58% participants found useful/partly useful for work/professional occupation that the acquired skills gained through 3D printing workshops (Fig.7). 43% of respondents did not consider useful the acquired skill for work/professional occupation. This could be seen as an indicator related to the sector of 3D printing is still not well known and developed.

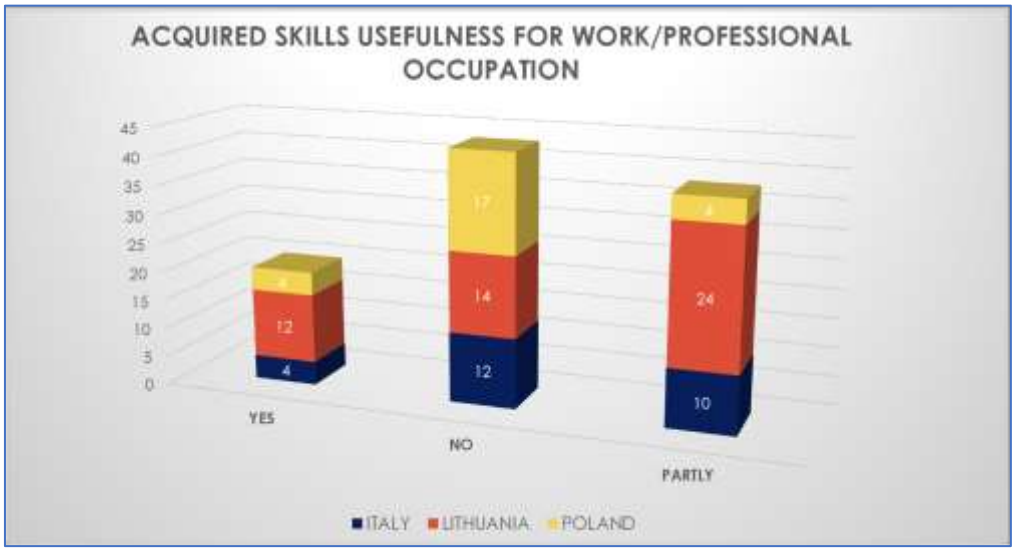

Fig. 7

Within Phase 1, we also asked participants if they found the skills acquired through the workshops useful for their everyday life. About 64% of participants replied *Yes/Partly* to this question, against 37% of participants who replied as *No.* This could be understood as the Design thinking Methodology is useful on a broader variety of issues and not just for the 3D printing.

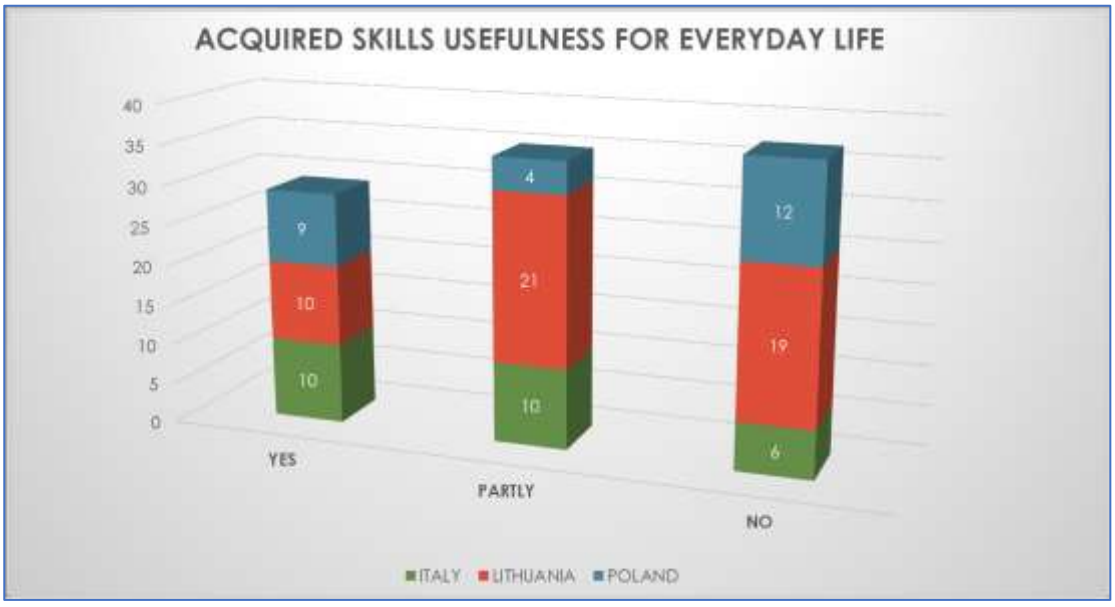

Fig.8

- **ACQUIRED SKILLS USABILITY IN THE NEAR FUTURE**

  As shown in the Fig.9 below, about 57% of respondents replied positively to the question n.8 of the questionnaire regarding if they were planning to use the acquired skills in the near future. This could be seen as that 3D printing workshops provided tools and knowledge that is going to be used by participants and therefore they respond to their needs. Furthermore, in Italy and Poland, a vast majority of respondents showed a very strong probability of using the 3D printing workshops acquired skills in the near future.

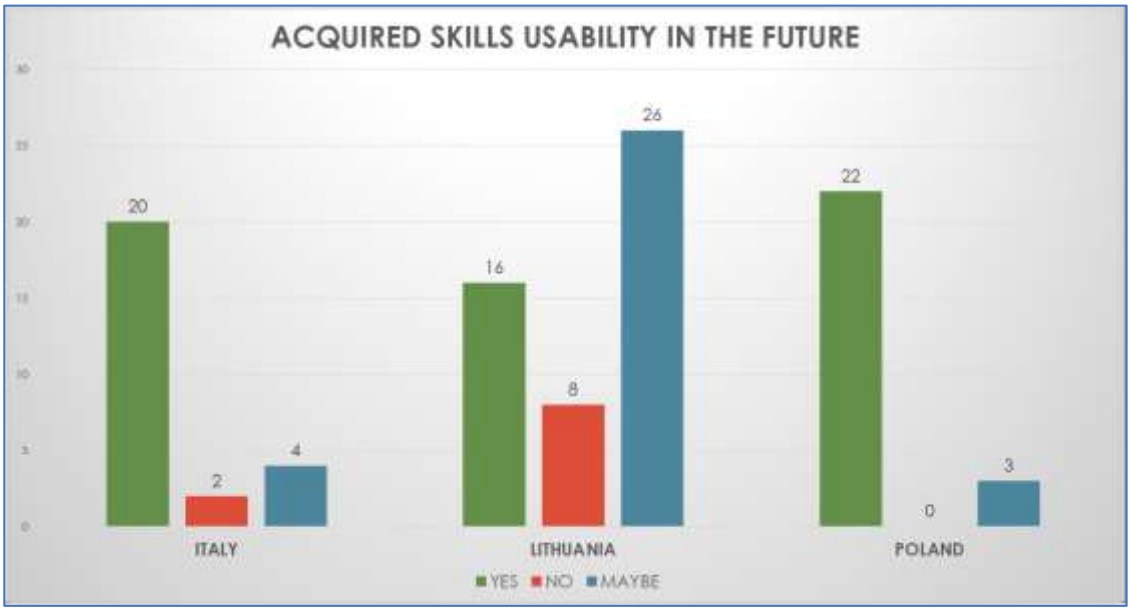

Fig.9

- **USE OF THE ACQUIRED SKILLS**

  To those who replied positively to questions n. 6-7-8, it has been asked to better specify how the 3D printing workshops acquired skills had been used by participants. The results were the following: Job/ Business (26%); Everyday Life (25%); Repairing Things/Spare Parts (16%); Educational Field (13%); Specific Projects (10%) and Other (10%). These responses show without any doubt the sector in which 3D printing courses have been useful and therefore, this could be seen as one of the main impacts of the project.

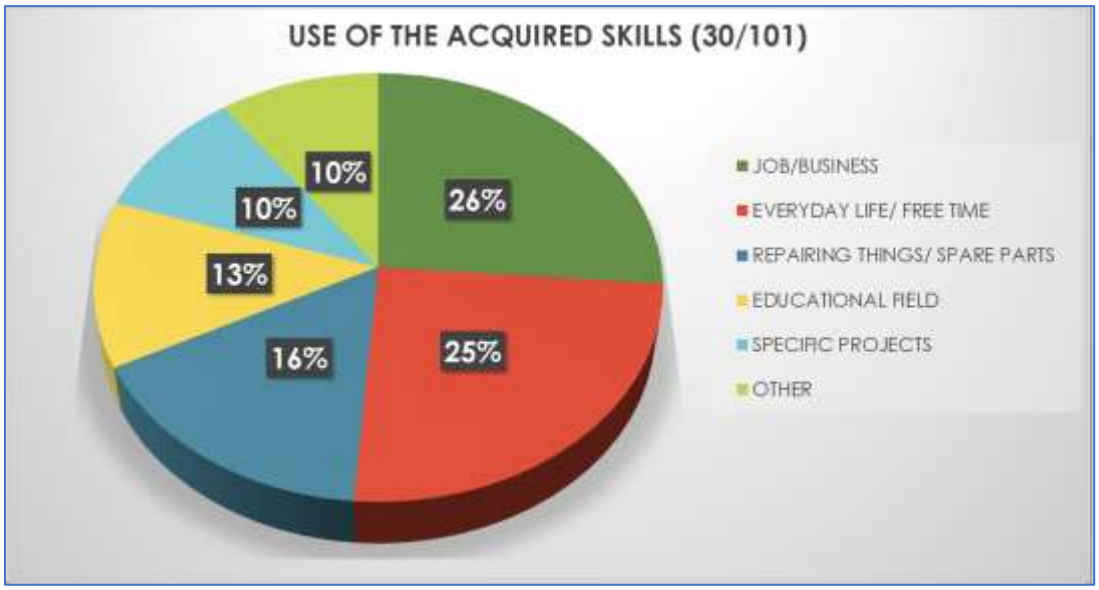

Fig. 10

It must be reported as well that 37 people (37,3% of the respondents) replied NO to the question n.10 of the Phase 1 questionnaire identifying the following reasons:

- *I am retired;*
- *I am unemployed;*
- *I work all day and I have no time;*
- *I rarely use the 3D printers in my office;*
- *I do not have time;*
- *I do not see the applicability of these skills to my current employment;*
- *I had no chance to use 3D printing;*
- *I am too old and I doubt that I will use 3D printing (etc..).*

This could be understood as external circumstances related to the personal conditions of the respondents and it has to be pointed out that some of them did not really reply to the question.

- **WILLINGNESS TO CONTINUE BEING TRAINED ON 3D PRINTING.**

Lastly, it has been asked to participants about their willing to continue to be trained on 3D printing. 80% of respondents replied positively. This result can be considered as another main positive impact of the 3D printing workshops implemented through the workshops.

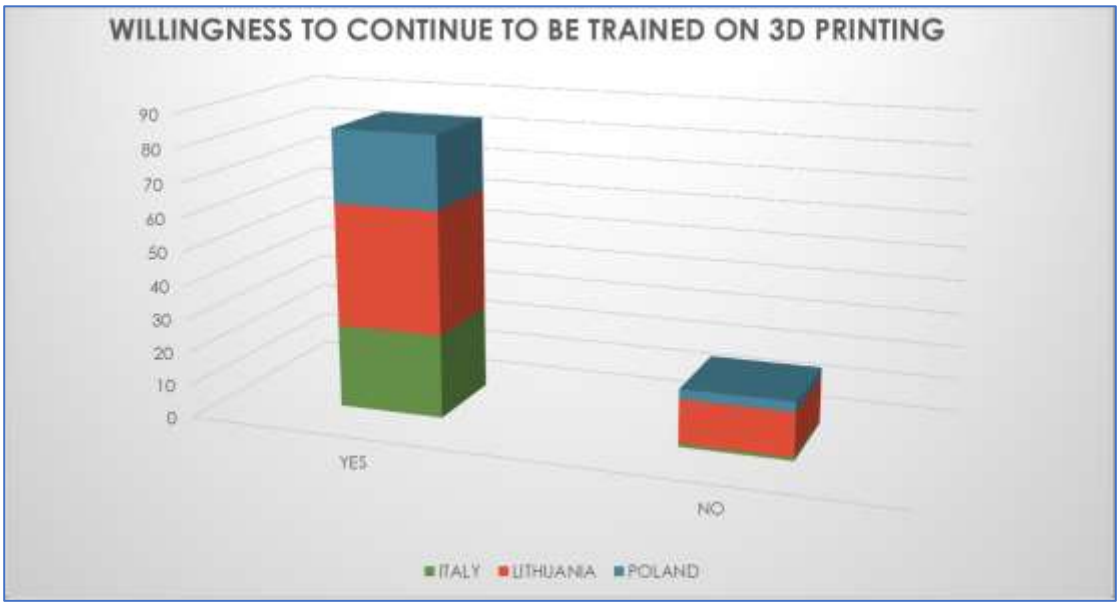

Fig. 11

PHASE 2 INTERVIEWS

Phase 2 interviews have been submitted to acquire qualitative data to be used together with the results of the Phase 1. A total number of 5 questions has been submitted to some respondents of phase 1 that voluntarily accepted to be interviewed. The interviews have been carried out mainly by phone, but also through face-to-face modality.

As shown in Fig. 12, about 90% of participants had their expectations met regarding 3D printing workshops contents.

Fig.12

Some of the answers collected were the following:

a) *When I found out that there was a training on 3D printing, I didn't really understand what 3D was. I was very interested because it was a training for people who didn't know anything yet. I didn't have any high expectations, I just wanted to get to know and learn about 3D printing. Maybe I expected the training to explain in simple terms how 3D printing works and where it can be applied;*

b) *Since one of the schools I work at has all the FabLab equipment, I felt a gap in my knowledge about where to start from with 3D modelling and creation of an item with 3D. During the training, I immediately gained a clear understanding of how it is done. The knowledge delivered was simple and clear but also deep. The logic behind the learning activities were very helpful to me;*

c) *My expectation was to learn about 3D printing in general, the possibilities that 3D printers offer, whether they can be used at home and at work. The workshop showed me the possibilities of using 3D printers both professionally and privately. The workshop met my expectations;*

d) *I was inexperienced and I was looking for a basic course to learn 3D printing basics. I had no experience and therefore I was trying to learn as much information as possible. The workshop fully met my expectations and therefore I am satisfied.*

Fig.13 shows that the workshops had mainly an impact on personal development of participants (65%); for 35% of the interviewed, workshops had an impact on professional development; for 10% of the interviewed the workshops had an impact on both personal and professional development.

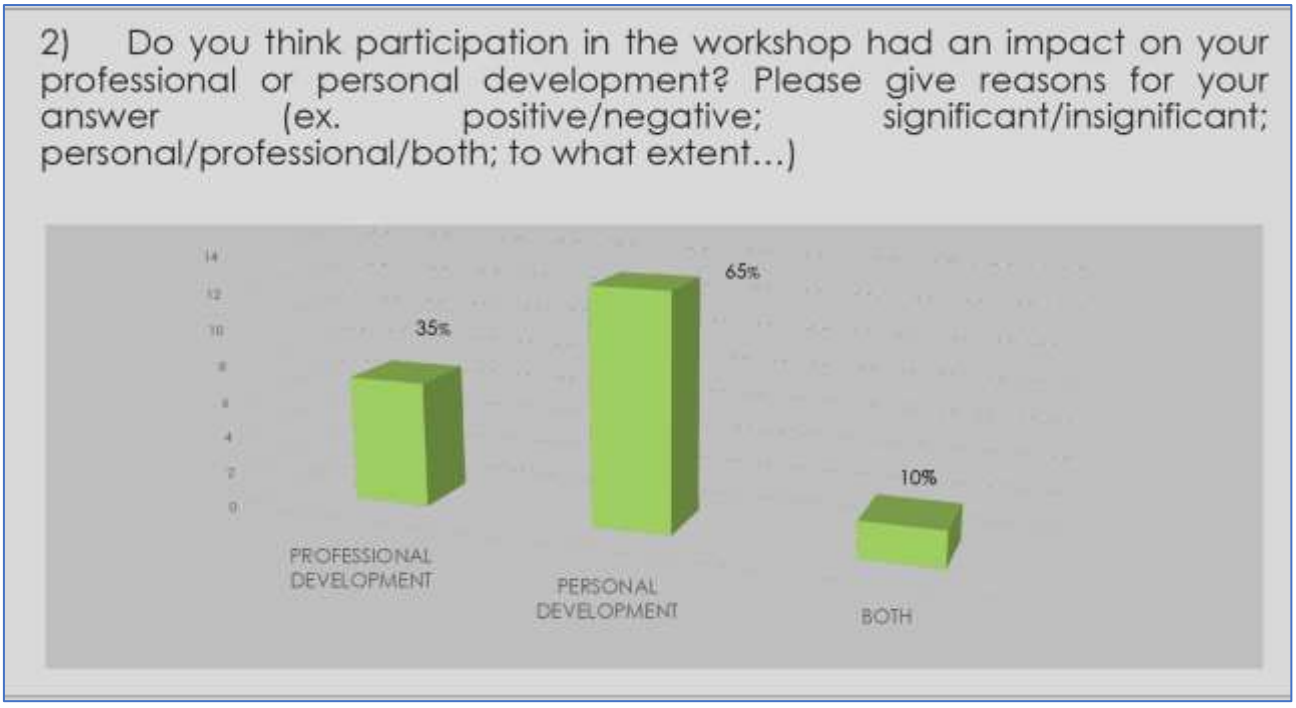

Fig.13

Some of the answers collected are reported hereafter:

a) *That the training has had a positive impact, that's for sure. And I'm not just talking about the 3D printing workshop itself, but also about the great atmosphere during the workshop. Since 3D printing is new to me, it really gave me knowledge that I didn't have before;*

b) *[…] Thanks to the training, it became clear to me how I can create a smart restaurant project for a special project at our school. It is a project that includes a robot (already constructed) that would transport food. What needs to be created is a dish (a plate or a bowl) where food would be put into and for this, I will use the 3D skills. I have made a draft design and still need to print and test it. So, it is beneficial for me personally because it will allow me to complete this project in a way that is needed. Also, I have some ideas for my household that I would like to implement (something beautiful, more out of decoration purposes). I am thinking about upgrading the kitchen lights (for instance, in another training we designed a lamp out of multiple 3D printed parts that were later joined together). It would not be a project out of necessity, but entirely a creative task for decoration purposes […];*

c) *I think attending the workshop made me aware of the tools available that are not well known, but which can make a difference to many companies and organizations. This includes my workplace where we can print promotional items or start providing 3D printing workshops;*

d) *Absolutely yes, although I need more practice in 3D printing. I am sure that the 3D printing process could be used to replace parts of equipment I use at work but I need more experience with 3D printing.*

Another area of investigation analyzed within Phase 2 was related to the contribution given by 3D printing workshops to the job hunting and to career advancement. 70% of the people interviewed replied in a positive way.

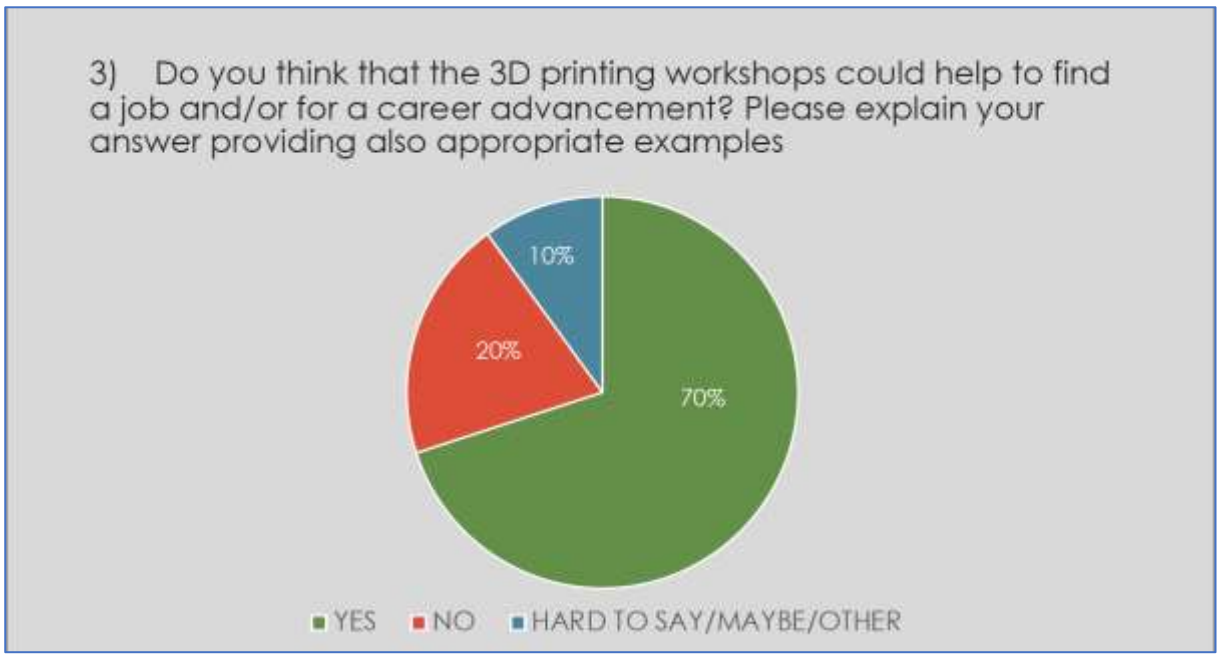

Fig.14

It is interesting to report some of the responses collected:

a) *Could I work with 3D printing? I think so. I'm studying medicine and certainly very often the technology itself is used in the field. So I think that in the future it will become part of my daily work;*

b) *The knowledge of 3D could be useful in my professional field if I wanted to focus on data visualization, but not in my current position. Currently I see the application of 3D skills more as a hobby. I do not plan to change my profession now, but maybe in the future, when I learn more about it, it could be interesting to do more in this field (like teaching kids etc.);*

c) *I am not looking for a job so this aspect does not concern me. In terms of career development, I see an opportunity to use my knowledge to do marketing (printing promotional gadgets) and to teach students using 3D printer;*

d) *I think that workshop, in addition to help studying 3D printing topics, has provided me with the skills to tackle complex problems and to work in groups which are always useful both on an individual and work level.*

Fig. 15 shows the ranking of the skills that have been developed by 3D printing workshops, in accordance with the responses collected during the interviews. It is interesting to note that top 3 skills developed are: Teamwork, 3D printing/printer knowledge and Design Thinking. All these elements are in line with the aim of the project proposals.

Fig.15

Last figure shows if the people interviewed would like to continue to be trained in 3D printing. Many of the people interviewed (80%) want to continue to be trained and this is completely in line also with Fig. 11 previously mentioned.

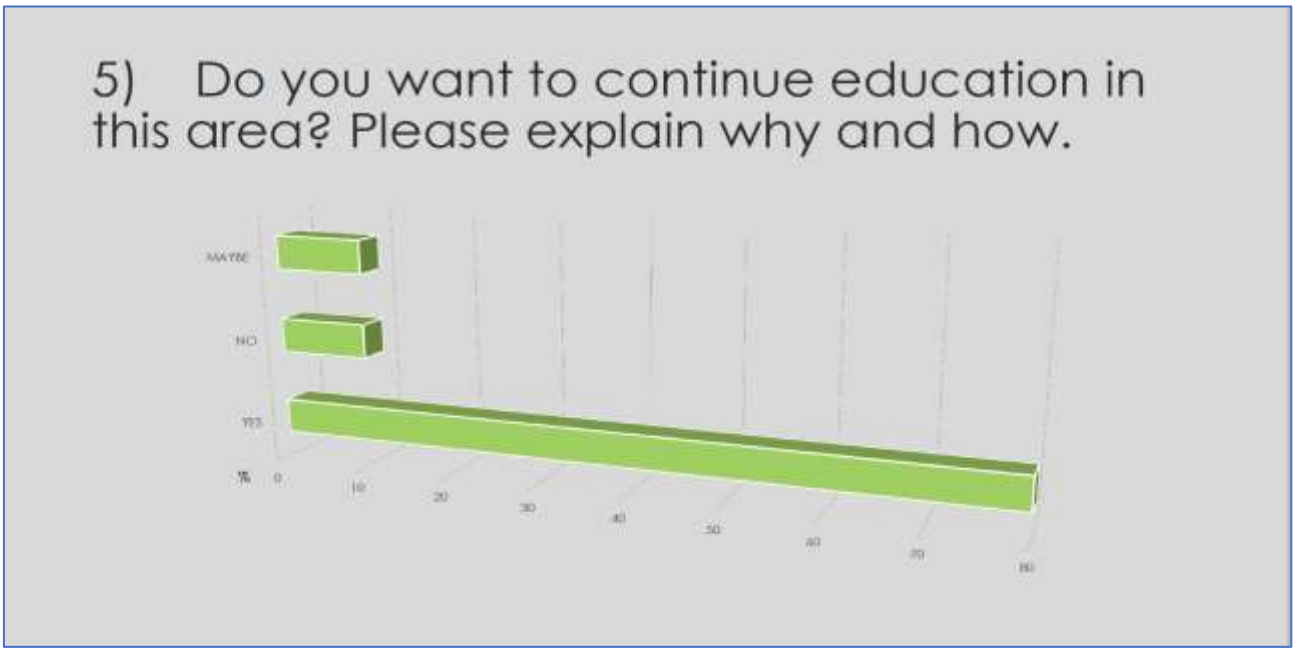

Fig.16

Hereafter are reported some of the collected answers:

a) *Coming into the training, I already knew about 3D printing. But I still want to learn more, it's a very interesting field for me. If there were more trainings like this, I would definitely attend;*

b) *I would like to learn more about 3D animation. I was thinking about a vocational training course on this topic, but the tuition fee is extremely expensive. I am thinking about some other options. I would like to make a virtual exposition about our little town and its points of interest. But I still lack skills for it, so more time is needed for the realization of this idea. Learning on my own is possible, but it would be much easier to get help from the facilitators, so training would be most helpful;*

c) *Of course. I am organizing 3D training at my workplace;*

d) *Yes, absolutely. When I finished high school, I was interested in this world (DIY lab). I didn't know about the activities of the Fab Lab. Since they inaugurated it, I have been very happy with the opening of this lab and free courses. I hope that this type of activity can continue, expanding with new courses and tools and also involving further interested people. For 3D printing, I am interested in further courses with more advanced aspects (other materials, printing techniques and other software).*

CONCLUSIONS

Phase 1 and Phase 2 results of the research shows without any doubt that the 3D printing workshops had positive impacts on the participants.

The main findings can therefore be summarized as it follows:

- Acquired skills by workshops' participants have been useful mainly for personal life (free time, hobby, personal projects) of the participants, including the Design Thinking methodology;

- Acquired skills by workshops' participants have been useful for work purposes and for job hunting as well, improving thus the employability of candidates with 3D printing knowledge;

- 3D printing has been used for printing spare parts and repairing things because it is cheaper and allows to print parts no longer available in the market. Therefore, 3D printing skills contribute to reducing waste, supporting thus the EU Green Deal and the EU circular economy action plan contribute to the UN Agenda 2030 (SDG 12 – Ensure sustainable consumption and production patterns);

- Further training activities on 3D printing should be provided including youths and schools in order to spread this kind of technology among the young generations.

EX-POST RESEARCH PHASE 1 - QUESTIONNAIRE SUBMITTED VIA GOOGLE FORM

QUESTIONNAIRE FOR 3D PRINTING WORKSHOPS PARTICIPANTS -

EX POST RESEARCH (PHASE 1)

Dear participant,

please fill out this anonymous questionnaire after the 3D workshop. Your feedback will be very helpful to analyse the outcomes of the workshops.

Thank you!
* Compulsory reply

1-Select your gender: *

- Male
- Female
- Other
- Prefer not to say

2-What is your age? *

- 18-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-69
- 70-74
- 75-79
- Above 80 years old

3-What is your highest level of education? *

- Less than high school degree
- High school degree or equivalent
- Vocational education degree
- Non-university bachelor degree

- Bachelor degree
- Master degree

4-What is your status of employment? *

- Employed (full time)
- Employed (part time)
- Not employed and looking for work
- Not employed and not looking for work
- Retired
- Not able to work

5-Are you a person with migrant background? *

- Yes
- No

6 - Did you use the skills acquired during the 3D printing workshops (technical and soft skills) for your work or other professional occupation? *

- Yes
- Partly
- No

7 - Did you use the skills acquired during the 3D printing workshops (technical and soft skills) in your everyday life? *

- Yes
- Partly
- No

8 - Do you have any plans to use these skills in the near future in your professional occupation or everyday life? *

- Yes
- Maybe
- No

9 - If you answered YES OR PARTLY/MAYBE to the questions above (questions n.6-7-8), please explain how and where you used or plan to use these skills:

_____
_____
_____
_____

10 - If you answered NO to the questions above (question n.6-7-8), could you tell why you think you did not or will not use these skills?

_____
_____
_____
_____

11- Would you like to continue learning about the 3D methodology? *

- Yes
- No

12- Our research also includes interviews with participants. Our team will contact you at an agreed time by phone, Zoom or messaging programs (Messenger/WhatsApp/Viber). You will be asked several open questions about your opinion and experiences related to learning 3D printing. Please write your email address below if you agree to participate in this short interview:

_____

EX-POST RESEARCH PHASE 2- INTERVIEW QUESTIONS

OPEN QUESTIONS

– EX POST RESEARCH (PHASE 2)

General information:

- Gender: Male/ Female/Other/Prefer not to say
- Age:
- Level of education: Less than high school degree/ High school degree or equivalent/ Vocational education degree/Non-university bachelor degree/Bachelor degree/Master degree
- Status of employment: Employed (full time)/ Employed (part time)/Not employed and looking for work/Not employed and not looking for work/ Retired/ Not able to work
- Migrant background: Yes/No

1. **Did the 3D printing workshop contents reflect your initial expectations? Please justify your answer by explaining, starting from your expectations, how these were met or not.**

2. **Do you think participation in the workshop had an impact on your professional or personal development? Please give reasons for your answer (ex. positive/negative; significant/insignificant; personal/professional/both; to what extent…).**

3. **Do you think that the 3D printing workshops could help to find a job and/or for a career advancement? Please explain your answer providing also appropriate examples.**

4. **Do you think the 3D printing workshop helped you to develop some skills? If yes, what skills do you think you have developed? To what extent? How useful do you think they are for your professional and personal development? Can you give some examples where the acquired skills have proved to be useful?**

5. **Do you want to continue education in this area? Please explain why and how.**

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