**General Feedback**

Project evaluation questionnaires have been replied by participants 3 times: in 2019 – at the beginning of the project, in 2020 - in the middle of the project and in 2021 - by the end of the project. Therefore, longitudinal data analysis can be done tracking how findings for specific questions change over time. Overall, 41 questionnaires have been obtained, 27 (65,9%) from German participants, 10 (24,4 %) from Lithuanian participants and 4 (9,8%) from Polish participants. Among them 27 (65,9 %) were male, 14 (34,1 %) were female, 25 (61,0 %) were students and 16 (65,9 %) were teachers. The age range of participants was from 11 to 73, the average age – 28,6 years old.

Respondents have evaluated project activities, their skills, abilities, project material and content, what they have acquired while participating in the project, the project itself from different aspects within evaluation scale form of a 0-10 ranking. Further, the tables give the average of evaluations for each period 2019, 2020 and 2021 separately and sig meaning which if is lower than 0,05 shows that it is statistically significant difference between those 3 annual evaluation averages.

**Key words**

**Longitudinal data analysis** (often called “trend analysis”) is basically tracking how findings for specific questions change over time. Your longitudinal data analysis shows a solid, upward trend in satisfaction with some second year deviations due to pandemic.

**Statistically significant(ly) means** “an assessment of accuracy.”  In particular, it means that survey results are accurate within a certain confidence level and not due to random chance. Means of sig in bold (in tables) meet the criteria.

**Table 1. Participants´ remarks concerning the selected activity (lecture, workshop, training ...)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Statement** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| The activity was:  totally boring 0; boring 2; adequate 6; interesting 8; inspirational 10 | 8,00 | 8,67 | 8,88 | 0,411 |
| Challenge of tasks or training vs relaxation periods was  overcharging 0; too easy 3; strong 5; easy 7; balanced 10 | **6,75** | **8,33** | **9,60** | **0,012** |
| The content of information or skill training seemed to be  useless 0; unimportant 3; OK 6; necessary 8; quite important 10 | 8,50 | 8,17 | 8,36 | 0,906 |
| My level of understanding was  poor 0; little 3; partly 5; most of 7; clear 9; everything clear 10 | **7,75** | **9,25** | **9,28** | **0,027** |

In this table (Table 1) you can see, what is statistically significant (p<0,05), that in 2019 challenge of tasks or training vs relaxation periods and level of understanding were lower than in 2020 and 2021.

**Table 2. Content, Ability, Skill, Training** (Value, how far the sentence is true! 10 (a lot), 0 (not at all)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sentence** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| I performed a polite attitude. | 9,25 | 8,75 | 9,36 | 0,418 |
| I spoke in short sentences, when possible. | 8,25 | 7,92 | 9,00 | 0,104 |
| I spoke clearly pronounced. | 8,25 | 8,25 | 9,08 | 0,422 |
| I tried, to mirror heard information or kept eye contact (careful active listening). | 8,25 | 8,50 | 9,08 | 0,146 |
| I supported my message by means of my body language. | 8,50 | 7,25 | 8,60 | 0,173 |
| I offered help to my team-mates. | 8,75 | 8,08 | 8,80 | 0,559 |
| I praised an achievement, before discussing an error. | 8,50 | 8,92 | 7,92 | 0,400 |
| I had good cooperation or felt warm atmosphere during the task. | 9,50 | 8,75 | 9,64 | 0,120 |
| I knew the necessary parts very well. | 9,25 | 8,75 | 9,32 | 0,461 |
| I kept the material in order. | 9,00 | 9,08 | 9,68 | 0,363 |
| I worked for my own mostly. | **8,50** | **3,17** | **5,92** | **0,008** |
| I asked partner, tutor or teacher for assistance. | 7,00 | 7,25 | 7,72 | 0,794 |
| I did not need help, but together it´s running smarter. | 8,75 | 7,42 | 8,76 | 0,177 |
| I assembled parts following an example. | 7,25 | 8,42 | 9,20 | 0,200 |
| I assembled parts following a picture or a step by step construction guide. | 7,50 | 8,08 | 9,64 | 0,062 |
| I found a solution for a task. | 9,00 | 7,92 | 8,80 | 0,496 |
| I developed an idea for a new machine or for an improvement. | 6,75 | 7,00 | 7,92 | 0,582 |
| I programmed the EV3 in LEGO-Language. e.g. LineFollow. DistanceStop. RunAround. FanRegulation. ObjectSorter… | 6,25 | 7,75 | 8,80 | 0,201 |
| I programmed the EV3 in SCRATCH (in OpenRoberta or by the current LEGO-CLASSROOM-Language). | 6,50 | 4,42 | 3,96 | 0,564 |
| I considered relations between my construction and environment. | 7,00 | 6,25 | 7,12 | 0,736 |
| I discussed recycling of technical devices, cars or machines. | 8,25 | 4,08 | 7,20 | 0,052 |
| I discussed advantages vs risks of automatisation and robots. | 9,00 | 7,08 | 8,20 | 0,407 |
| I talked about data-policy, workplace-change, health-risks, (global) catastrophies, war, financial market or poor vs rich. | 9,25 | 5,75 | 8,44 | 0,053 |
| Our team incorporated philosophical/ religious ideas into reflection. | 9,00 | 4,58 | 6,96 | 0,095 |
| Our teams exchanged results nationally and internationally. | **9,00** | **4,75** | **9,44** | **0,0001** |
| I kept in touch with partners from foreign countries. \_\_\_\_\_\_\_\_\_\_\_ | **9,25** | **2,25** | **5,48** | **0,019** |
| I used E-Mail, dropbox, WhatsApp, SKYPE, BigBLueButton, Video-conference or eTwinning. | **8,00** | **6,25** | **5,48** | **0,0001** |
| I took photos and notes of my constructions and programs. | **7,50** | **5,08** | **9,16** | **0,005** |
| I took videos (probably sent to teacher or international partner). | **7,00** | **3,25** | **7,16** | **0,045** |
| I sent questions to international partners (probably via teacher). | **9,00** | **2,17** | **5,00** | **0,015** |
| I answered questions, which I received from international partners. | **9,25** | **2,42** | **8,88** | **0,0001** |

The results (Table 2) show that statistically significantly (p<0,05) project participants spend more time on their own during the 2019 than during 2020 and 2021 but they also kept in touch with partners from foreign countries more often, used e-mail, Dropbox, Skype, etc. and sent questions to international partners. We can also see that statistically significantly (p<0,05) during 2020 they did not use the results of their teams at national and international levels, took photos and notes of my constructions and programs, took videos and answered questions, which received from international partners less often than during 2019 and the 2021. This shows how the first year (2020) of pandemics negatively impacted overall communication.

**Table 3. I will use knowledge and skills concerning Communication, ICT, ROBOTICs, ETHICs in my life…**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Statement** | **Means** | | | *Sig* |
| 2019 | 2020 | 2021 |
| I will use this in everyday communication in my family. | 6,00 | 6,33 | 6,48 | 0,959 |
| **I will use this at school, university or later for solving my job.** | **6,50** | **5,42** | **8,44** | **0,019** |
| I will use this in political discussions. | 7,75 | 4,25 | 7,20 | 0,064 |

Table 3 shows that statistically significanly i.e. more often during 2021 participants thought they would use knowledge and skills gained in the project in school, university and further in workplace. Also, the participants pointed out that they would use the gained knowledge in studies for technical profession or profession, giving advice to young and old people how to use the Internet for contacts with families, personal supply etc. by social media from e-mail up to videoconferences. Moreover, assembling Workstation as a gift for students in financial difficulties was welcomed because they needed equipment for following distance-learning-lessons during CORONA-PANDEMIC.

**Table 4. Remarks concerning material, methods, social impact, chances and risks**

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Statement** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| **The 46 steps LEGO®- software construction manual supports independent assembling of the robot vehicle.** | **8,58** | **9,60** | **9,27** | **0,027** |
| **Touchable devices keep (especially) younger students´ motivation alive, compared to just programming and simulation.** | **8,17** | **9,80** | **9,27** | **0,013** |
| Touchable devices are dispensible: Pupils may programme/simulate in NEPO, then test program 5 minutes with a real LEGO®-Robot. | 3,25 | 5,88 | 5,03 | 0,065 |
| **Graphical program-routines of LEGO®Mindstorms EV3 compensate little reading competence (vs NEPO scratch or Python).** | **5,00** | **8,16** | **7,14** | **0,008** |
| Integrated ethical, social, health, ecological and economic considerations as parts of studies might cause more responsibility than just some additional lectures in ethics. | 5,50 | 7,96 | 7,16 | 0,060 |
| We cannot avoid use of Chinese Face Recognition, but we can check, how political parties announce to deal with this technology. | 8,00 | 8,12 | 8,08 | 0,898 |
| Automatic Stock-Trade is a necessary advantage for worldwide trade. | 5,25 | 6,16 | 5,86 | 0,431 |
| Automatic Stock-Trade increases danger of stock-market-crashes. | 6,08 | 7,24 | 6,86 | 0,252 |
| Automatic Stock-Trade increases the difference between poor and rich. | 5,75 | 7,60 | 7,00 | 0,094 |
| **Worldwide, just a small rate of tax on every stock- or currency trade would avoid the growth of difference between poor and rich and help to save stock-market-crashes.** | **5,42** | **8,20** | **7,30** | **0,006** |
| **It´s normal to go forward with technology; no exchange of people by robots expected, except dangerous, boring or hard work...** | **6,00** | **8,32** | **7,57** | **0,011** |
| Driverless traffic system is out of control, because it´s not ready developed. | 6,58 | 7,20 | 7,00 | 0,495 |
| Responsibility in case of accident is not clear. | 7,58 | 7,12 | 7,27 | 0,657 |
| Driverless traffic system bears danger of hacks. | 7,83 | 8,36 | 8,19 | 0,451 |
| Driverless trains / cars or crewless ships / planes might be highjacked simply. | 7,58 | 8,08 | 7,92 | 0,544 |
| **There is more trust in driverless transport-systems on rails than on streets.** | **6,17** | **7,68** | **6,86** | **0,005** |
| Autonomous bus will be developed to a valid stage soon. | 6,00 | 7,24 | 6,84 | 0,183 |
| **Advantage in safer transport by driverless car systems, because DCSs are not drunk or stoned or ill.** | **5,17** | **7,68** | **6,86** | **0,020** |
| **DCS minimize exhaust gas pollution because of less cars on streets.** | **5,42** | **8,04** | **7,19** | **0,025** |
| **DCS public traffic from village to town can be easier or individual.** | **5,08** | **8,20** | **7,19** | **0,007** |
| **DCS public traffic is available for high aged people.** | **6,67** | **8,68** | **8,03** | **0,038** |
| Drones as weapons instead soldiers are scary. | 6,08 | 7,96 | 7,35 | 0,073 |
| **Drones can save lifes of attacking soldiers.** | **6,42** | **9,00** | **8,16** | **0,001** |
| **Lack of consciousness of responsibility at the attacking person, because the victim is far away.** | **6,00** | **8,40** | **7,62** | **0,013** |
| Weapons attract violence and war like motorways attract cars… | 6,25 | 7,80 | 7,30 | 0,104 |
| **There are different types of drones; for reconnaissance is OK.** | **7,00** | **8,56** | **8,05** | **0,049** |

The results (Table 4) show that statistically significanly project participants less often during the first period of the project than during the second and third period agreed with such statements as: The 46 steps LEGO®- software construction manual supports independent assembling of the robot vehicle; Touchable devices keep (especially) younger students´ motivation alive, compared to just programming and simulation; Worldwide, just a small rate of tax on every stock- or currency trade would avoid the growth of difference between poor and rich and help to save stock-market-crashes; It´s normal to go forward with technology; no exchange of people by robots expected, except dangerous, boring or hard work...; There is more trust in driverless transport-systems on rails than on streets; Advantage in safer transport by driverless car systems, because DCSs are not drunk or stoned or ill; DCS minimize exhaust gas pollution because of less cars on streets; DCS public traffic from village to town can be easier or individual; DCS public traffic is available for high aged people; Drones can save lifes of attacking soldiers; Lack of consciousness of responsibility at the attacking person, because the victim is far away; There are different types of drones; for reconnaissance is OK. This means that in the course of the project participants gained more confidence in technologies and robots. Practical activities and discussions about ehtics and future of ICT and robotics contributed to this confidence. As robots move from our imaginations into our schools, homes, offices, hospitals, parks and factory floors, instead of being aliens, they become partners that help us do so much more than we can do alone.

**Remarks concerning the whole project IRE**

**Table 5. Participation in the project caused positive side-effects of my personal development**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sentence** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| I know a lot more in ICT, ROBOTICs, AI etc. than before the project. | 9,25 | 8,17 | 9,04 | 0,364 |
| **I feel more self-confident than before the project started.** | **8,50** | **5,08** | **8,12** | **0,005** |
| I feel less fear, when asking something than before the project started. | 7,50 | 6,08 | 6,96 | 0,735 |
| **I feel myself more open-minded in international contacts, since I participated in the project.** | **8,25** | **3,83** | **6,60** | **0,041** |
| **I feel increasing my creative power, when working together with my team ERASMUS+.** | **8,25** | **6,08** | **8,68** | **0,025** |

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In Table 5 we can see that statistically significantly project participants felt less confident during the second period that before the project started, also they were less open-minded in international contacts and their creative power was incresing less when working together with their team ERASMUS+. This might be the issue of pandemic and quarantines which limited communication by closing everyone at home. Besides, the results in other tables also show that during the second period project participants were more closed, communicated beteen each other less, therefore, self-confidence, openness to international relationship and creativity decreased. We can also see that statictically significantly during the second period of the project (2020) participants felt less self-confident than before the project started, and were less open-minded in international contacts and worked with less creative power, when working together with team ERASMUS+. One participant mentioned the fact that “I´ve got my personal computer. Now I´m able, to join in Video-Conferences“as a positive effect of participation in the project.

**Table 6. Participation in the project caused negative side-effects of my personal development**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sentence** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| I learned that I am stupid, and now I feel less self-confident than before the project. | 0,25 | 1,17 | 0,36 | 0,166 |
| Other persons made bad jokes on me, and now I feel fear to ask something during meetings. | 0,25 | 0,83 | 0,08 | 0,079 |
| The project took away time for solving my genuine school-tasks, my friends or my free time. | 1,00 | 1,67 | 0,68 | 0,343 |

Table 6 shows that there are no statistically significant differences between three poject periods within two project-years concerning the negative aspect of participation in the project. Generally, evaluations are low what means that negative effects were not practically felt by participants.

**Table 7. Participation in the project caused some personal impact**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sentence** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| Content or skills of education, I got by participation in this project are:  additional **0** necessary **10** | 8,50 | 5,92 | 7,76 | 0,052 |
| The project has improved my communicational, technical, mathematical, political or \_\_\_\_\_\_\_\_\_\_\_\_ skills.  almost not **0** enormously **10** | 9,00 | 6,75 | 7,60 | 0,192 |
| The project has improved my ability for international understanding.  marginally **0** substantially **10** | 9,00 | 5,42 | 6,60 | 0,189 |
| The project has improved my future European employability.  not really **0** wide **10** | 7,25 | 5,92 | 7,36 | 0,477 |

Again, in Table 7, we can see that during the second project period (2020) the average evaluation of personal impact are rather low if compared with the second and third period, but these differences are not statistically significant.

**Table 8. General aspects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sentence** | **Means** | | | *sig* |
| 2019 | 2020 | 2021 |
| The projects relevance for the EU is:  Negligible **0** high **10** | 9,25 | 7,08 | 8,84 | 0,079 |
| **Participation in the project takes resources of time; this was:**  **wasted time 0 well spent time 10** | **7,75** | **7,42** | **9,32** | **0,019** |
| [Cost-benefit](http://www.dict.cc/englisch-deutsch/cost-benefit.html) [analysis](http://www.dict.cc/englisch-deutsch/analysis.html): The EU spends a lot of money for such a project; this is:  waste of EU-ressources **0** a rational investment **10** | 9,25 | 8,42 | 9,20 | 0,285 |

Table 8 shows that the opinion of the participants differs statistically significantly: during the third period (2021) i.e. by the end of the project, participants thought that participation in the project was a well-spent time. Also, in the comments, participants have mentioned that this project allowed to involve students of different age and different abilities in the same general task, fulfilling just different jobs. Using social media was really necessary because of pandemic. This seemed to be a disadvantage for teamwork, but by means of social media students with lacks in performance got individual advice from teachers, without recognition or mobbing by others. This increased self-confidence of those with special needs. The data show that participants gave very high ratings to almost all the aspects of project —meetings, online sessions, social events). Great project overall!