







Implementation and Evaluation of a Digital Resilience Program

Marjan Milošević^{1*}  [0000-0003-4730-1292], Biljana Đorić¹  [0000-0002-2821-4073],
Katarina Mitrović¹  [0000-0002-4035-5987] and Maria Grazia Mada Logrieco²  [0000-0002-9881-5034]

¹ University of Kragujevac, Faculty of Technical Sciences Čačak, Serbia

² University of Foggia, Department of Human Sciences, Italy

* marjan.milosevic@uni.kg.ac.rs

Abstract: *Digital resilience refers to the adaptive capacity for overcoming the challenges of the digital landscape. It encompasses the ability to effectively respond to and recover from adverse online experiences, demonstrating mental agility and digital competencies. We developed a program "Digital Resilience and Networking" under the Erasmus+ project "Enhancing digital and psychological resilience through peer networking in the online environment in times of crisis". This paper describes the layout and implementation of the program: the piloting phase (implemented in hybrid mode in the English language at three partner universities from Serbia, Poland, and Italy), the evaluation, and its implementation in Serbian language (national training, held fully online). We prepared a questionnaire to evaluate the effects of the course and cross-analyzed the training session evaluation (international pilot - 35 feedback records, and national training - 32 records). The evaluation showed high ratings for both phases, revealing significant differences between them. Furthermore, a strong correlation was found between participants' satisfaction with the program's implementation and their perceived skill acquisition. These results offer valuable insights into the efficacy of the program in enhancing digital resilience skills and emphasize the significance of well-implemented courses for optimal learning outcomes.*

Keywords: *digital resilience, course development, course evaluation, training effectiveness, skill acquisition*

1. INTRODUCTION

The importance of information technologies (IT) in every aspect of our society is constantly increasing. Therefore, IT issues can severely impact everyday life. Disruption of Internet communication, loss of data, website downtime, and switching to online learning are some of the abrupt challenges that many individuals and companies face. Globalization brought remote crises to everyone's homes. Dealing with such disruptions builds one's capability to cope with challenges, absorb major shocks, adapt, and move to a stable state. Such capability is referred to as digital resilience [1]. Further research enlightened the construct of digital resilience, recognizing the role of peer networking and resilience as a process [2].

Building digital resilience heavily relies on individual experience and is mostly built spontaneously. However, training can be of great importance in supporting the development of one's resilience. An example of such a program is given in [3], where the role of training in recognizing fake news was explored and a positive effect of training on individuals' ability to identify fake news on social media was demonstrated.

Several studies reported the positive effects of digital resilience training in enhancing digital resilience [4, 5, 6, 7]. The study [4] used a qualitative process evaluation approach to examine how students interacted with the asynchronous and synchronous versions of the digital resilience skill enhancement program (RISE). The analysis of themes derived from the participants' comments revealed how the RISE program aided them in their journey towards resilience. Students found the digital resilience program suitable and were able to use their newly acquired skills to boost their resilience and learning [5]. Despite suggesting several improvements to enhance the program's rigor, the study's findings indicate that digital resilience programs are crucial for students' well-being. Another study [6] developed an online ResilienceOnline (ROL) program employed in the context of sales management. Participants found the resilience training highly enjoyable and recognized its potential to enhance their job performance and life skills, which shows the importance of digital resilience skill development in different environments. The primary aim of the study [7] was to evaluate the feasibility of the newly developed RESIST training, a new hybrid

web-and app-based digital resilience intervention for employees, in terms of usability, user behavior, user experience, and motivation to use it. Additionally, the study aimed to explore the preliminary effects of the intervention on stress reduction and resilience enhancement through a pilot randomized controlled trial. The results suggest that a resilience intervention can positively impact employees' ability to manage stress and enhance their resilience. The authors of the study [8] investigated the role of digital resilience as a mediator and the role of training protocols as a moderator between the adoption of artificial intelligence and digital innovation links. The results emphasize the importance of digital resilience skills in adopting digital innovation.

This paper presents the implementation of the program 'Digital Resilience and Networking' (also referred as Program B). It is a second part of the 3-program training¹ "Step by step from trainees to trainers and supporters in student peer support network" developed under Erasmus+ project "Enhancing digital and psychological resilience through peer networking in the online environment in times of crises" (DigiPsyRes), coordinated by the University of Kragujevac [9]. The project goal is to develop a peer support network able to assist students in need regarding psychological and digital resilience. In this paper, the implementation of the two phases of the program "Digital Resilience and Networking" is presented - international pilot training in English language and national training in Serbian. Further, the comparison of the evaluation results for the English and Serbian instruction modes is performed.

The main aim of this paper is to determine the differences in the evaluation of the realized pilot e-course of the Program B and national training and to explore the correlation between estimated satisfaction with the realized courses and developed skills. One of the goals is also to determine the relationship between satisfaction with the course implementation and the assessed acquired skills based on the participants' subjective evaluations.

2. THE TRAINING IMPLEMENTATION

There are three objectives students are supposed to achieve with the training "Step by step from trainees to trainers and supporters in student peer support network". First, students should be trained to foster their resilience and to develop skills to cope with different challenges. Second, students are trained to assist other students in need, i.e. to provide peer support. Third, selected students are involved in training activities as trainers. Besides

the students, who are the primary training target group, the faculty staff is also involved and trained. The training is set in three iterations: international pilot training in the English language, national training in the Serbian language, and peer-moderated training.

2.1. The objectives of Program B

Objectives of the Program B - "Digital Resilience and Networking" are as follows:

- introducing the concept of digital resilience and its place in the general resilience of a person,
- presenting core features of self-awareness regarding malicious behavior and software misuse,
- introducing the external and internal threats and core defense mechanisms,
- demonstrating privacy control on popular social network platforms,
- discussing various cyberbullying scenarios,
- presenting features of digital resilience in online learning, and
- highlighting the importance of critical thinking regarding social networks and Internet news.

2.2. The implementation of Program B

The program B - "Digital Resilience and Networking" consists of four parts:

- Information security fundamentals;
- Social networks, privacy control and cyberbullying;
- Digital resilience and online learning; and
- Internet sources and critical thinking.

Before the training day, a pre-training activity was set up. Participants were enrolled in the Program B Moodle course and directed to read brief introductory material, before the start of the training. The training was scheduled as a 6-hour session, supplemented with asynchronous activities on the Moodle online learning platform.

The pilot was organized in three partner countries simultaneously: the University of Kragujevac, Serbia, the University of Foggia, Italy, and Kazimierz Wielki University from Bydgoszcz, Poland. Training was setup in hybrid form. Attendants from each partner university were gathered in their local classrooms with facilitators working face-to-face, while interconnected via Zoom. The University of Kragujevac established two groups, one in Kragujevac and one in Čačak. The training was led by teachers from the University of Kragujevac located in Čačak, while Cyberbullying and Fake multimedia were presented by teaching staff in Bydgoszcz.

Briefly, the workflow of the pilot training was set as follows:

¹ Program A is "Psychological resilience, wellbeing and support" and program C is "Horizontal psychological support in the digital network and ethical framework"

- The teacher is giving a lecture. Attendants in the same room are listening face-to-face and following the instructions. Remote attendants are following the instructions via Zoom. The communication was in the English language.
- Participants perform various kinds of activities, engaging in different teaching forms. They post comments and answer questions in Moodle chat and solve quizzes. Participants also work in groups and report summaries, either face-to-face, via Zoom, or in Moodle forums.
- Facilitators are assigned to each group and their role is to foster communication and report

for certain group tasks (directly or via Zoom chat).

The national training was slightly modified. The content remained unchanged, while the course delivery was set fully online. Participants, including teachers and facilitators, attended the lecture remotely. Facilitators were supporting group work in breakrooms (separate rooms), formed for certain activities. The pre-training and post-training activities aligned with the activities in the pilot phase. The summarized structure of activities for Program B is presented in Figure 1.



Figure 1. The structure of activities for Program B

2.3. Information Technology Support

The program B - "Digital Resilience and Networking" is heavily dependent on technology. In this section, more details on the program implementation, from the technology perspective, are provided.

Zoom was chosen as a video conference solution for the following reasons:

- The premium license with no time restriction was already owned.
- It allows setting up two cameras (one for the presenter and another to record the participants in the classroom).
- All users were already familiar with Zoom.
- Zoom supports breakout rooms, a convenient way to isolate groups of students and enable them to collaborate separately.

In piloting, participants did not run Zoom on their computers - only one computer per room was connected to the Zoom conference, administered by the teacher or facilitator. Since the videoconference is a demanding application, running other resource-consuming applications on the computer used for the Zoom conference was strongly discouraged.

The Moodle platform in use was 3.11.8+ (available at <http://eucenje.ftn.kg.ac.rs>). All participants, teachers, and facilitators were enrolled to the program course. Standard Moodle modules were used. The WordCloud plug-in was installed to obtain participants' reflections using the word-cloud form. Participants used computers (either their own laptops or classroom computers) to execute tasks in Moodle or to perform certain tasks outside Moodle (e.g. to test their e-mail on haveibeenpwned.com). No special application was required.

2.4. Post-training

The post-training comprises activities to be taken as a follow-up to the main training. Participants contributed to specified tasks on Moodle forums. Also, all participants were enrolled on a distinct Moodle course for student assessment and training evaluation, where evaluation of all programs was conducted and where participants took the final test. The test was configured as a typical Moodle quiz, with 20 closed-ended questions. Additionally, this course provided the training participants the opportunity to contribute with their comments in open form.

3. METHODOLOGY

The main aim of the research is to evaluate differences in efficiency the international (pilot) training and national training. The quantitative method was conducted. The developed questionnaire and research procedure are explained in the following chapters.

3.1. Questionnaire

The implemented courses were evaluated using a questionnaire that the participants filled out after they completed all three programs (A, B, and C) in English (pilot training) and in Serbian (national training) languages (Table 1).

Table 1. Evaluation questionnaire for Program B

| |
|---|
| Evaluate the quality of the lessons in e-course B with the grade (from 1 – strongly disagree to 5 - strongly agree). |
| 1. The content and activities of the B e-course and B training are connected and harmonized. |
| 2. Lessons in the B e-course are useful for the B program outcomes. |
| 3. The tasks in e-course B were well-designed and realistic. |
| 4. The workshops in the B training were dynamic and well-designed. |
| 5. The leading trainer from B training and facilitator/trainer in my group coordinated activities and encouraged the work of the group. |
| 6. I am satisfied with the exchange of ideas in remote online mode in B training between six university groups. |
| Evaluate the quality of the lessons in e-course B with the grade (from 1 – very poor to 5 - excellent). |
| 1. The B program contributed to my better understanding of the concepts of digital resilience and cyberbullying. |
| 2. The B program contributed to my better recognition of digital disruption events and behaviors and most frequent threats. |
| 3. The B program contributed to improving my skills in applying basic digital protection mechanisms. |
| 4. The B program contributed to improving my skills in how to react to various cyberbullying scenarios. |
| 5. The B program contributed to developing the skills necessary to contribute positively to the network's collaborative and supportive environment. |
| 6. The B program contributed to identifying my need to seek help from others in the context of online teaching and learning. |
| 7. The B program contributed to developing my skills to apply strategies for evaluating information on the network. |
| 8. The B program contributed to recognizing reliable URL addresses and ways of presenting checked information in an online context. |
| 9. The B program contributed to improving my skills to apply rules for sharing information on the network. |

The questionnaire was an integral component of the Erasmus+ project "Enhancing digital and psychological resilience through peer networking in the online environment in times of crises". The primary aim of DigiPsyRes was to enhance the capacity, readiness, and procedures necessary to empower students in boosting their digital and psychological resilience.

The questionnaire served to identify and analyze the difficulties students faced during the program, as well as their perceptions of the importance of this program in bolstering psychological and digital resilience. The questionnaire acted as an instrument to encourage critical thinking and receive valuable feedback that can measure the success of the program and give insight into possibilities for improvement.

Participants were informed there were no right or wrong answers. The objective was to reflect on their own experiences and perspectives through the statements provided. Responses played a crucial role in evaluating the project and refining the training program. Their engagement contributed significantly to understanding this critical topic and enhancing the training program for future participants.

The questionnaire was composed by the project team and published using Google Forms. It comprised several sections and typically took about

10 minutes to complete. However, there was no time limit for completion. The evaluation included evaluation of teaching materials, applied e-tools, complexity of tasks and activities, way of implementing training, development of e-course, and teaching communication. The prerequisite for DigiPsyRes training evaluation was completing pre-training activities, e-courses, training, post-training, self-assessment, and assessment activities.

The evaluation consisted of five parts.

- First part - Evaluation of the DigiPsyRes program;
- Second part - Evaluation of the program A;
- Third part - Evaluation of the program B;
- Fourth part - Evaluation of the program C; and
- Fifth part - Evaluation of the participation.

This paper focuses on the evaluation of the program B. The questionnaire aimed to evaluate various aspects of the program B training within the DigiPsyRes project. Participants responded to a series of statements. One of the primary focuses was to determine whether the content and activities of the program B were connected and harmonized. This assessment was crucial to ensure that the program's components were effectively aligned to provide a cohesive learning experience. Another important aspect evaluated was the usefulness of the lessons for achieving the B

program outcomes. Participants were asked to rate how well the tasks in the e-course were designed and how realistic they found them to be. Additionally, the dynamism and design of the workshops in the program B training were assessed to understand their impact on the participants' learning experience. The effectiveness of the leading trainer and the facilitator in coordinating activities and encouraging group work was also scrutinized, as their roles were pivotal in fostering a productive and supportive training environment. The questionnaire also delved into the participants' satisfaction with the exchange of ideas in the remote online mode, particularly between the university groups involved in the program B. This aspect was essential to gauge the level of engagement and collaboration facilitated by the program. Participants were further asked to rate the overall quality of the lessons in the program B, providing a comprehensive view of the course's effectiveness. In terms of the program's impact, the questionnaire assessed its contribution to understanding digital resilience and cyberbullying concepts. It evaluated how well the program helped participants recognize digital disruption events, behaviors, and common threats. Moreover, it examined whether the program improved participants' skills in applying basic digital protection mechanisms and reacting to cyberbullying scenarios. The development of skills necessary for contributing positively to a collaborative and supportive network environment was another critical area of evaluation. The questionnaire also identified participants' recognition of the need to seek help in the context of online teaching and learning. It assessed the improvement in skills for evaluating information on the network, recognizing reliable URLs, and presenting verified information. Finally, it evaluated the enhancement of skills related to applying rules for sharing information on the network. This comprehensive evaluation provided valuable insights into the effectiveness of Program B in enhancing digital and psychological resilience among students.

The questions were divided into two groups:

- items regarding the courses and their realization, which contained 6 items, and
- items regarding the estimation of developed skills after courses, which contained 9 items.

For the evaluation of different aspects of Program B, a 5-level Likert scale was used. The five-point scale allowed participants to express to what extent they agree or disagree with a particular statement.

The five degrees mean:

- 1 – Strongly disagree;
- 2 – Disagree;
- 3 – Undecided;
- 4 – Agree; and
- 5 – Strongly agree.

In some cases, a five-point scale is used as a grading scale: 1 (very poor), 5 (excellent). Both subscales have high reliability according to Cronbach's alpha coefficient (0.95/0.97).

3.2. Variables

Evaluation of the Program "Digital Resilience and Networking" was divided into two subcategories:

- program implementation, which measures satisfaction with the program and its implementation, and
- developed skills, which measures the estimation of developed skills after training.

For each category, two types of training were evaluated:

- international pilot training, where the English language was used for providing instructions and communication between groups, and
- national training, where the Serbian language was used for providing instructions and in separate group activities.

3.3. Sample and procedures

The international pilot phase of Program B was conducted synchronously on January 10th, 2024, across three universities: the University of Foggia in Italy, the University of Kragujevac in Serbia, and Kazimierz Wielki University in Bydgoszcz, Poland. During this phase, eighty trainees were enrolled, and 35 of them participated in evaluating the program. Subsequently, the national phase of Program B was held on 29.3.2024. at the University of Kragujevac, with 32 trainees enrolled and 32 completing the evaluation. Overall, the total evaluation sample comprised 67 participants.

To compare the effectiveness of the program, a statistical analysis was conducted on the evaluations from both the international phase, and the national phase. This analysis aimed to compare satisfaction with the program's implementation and the estimation of acquired skills after the training.

This paper focuses on the realization of Program B in two distinct phases: the international phase, using English as the medium of instruction, and the national phase, using Serbian. It examines two key categories: participant satisfaction with the program's implementation and the perceived acquisition of skills post-training.

The evaluation of Program B, conducted at the conclusion of all activities including both the training sessions and the completion of e-course activities, was carried out using a questionnaire hosted in the post-training e-course on the Moodle learning management system. This comprehensive evaluation approach ensured that feedback was collected systematically, providing valuable insights into the program's effectiveness across different languages and instructional contexts.

4. RESULTS AND DISCUSSION

The main research aims of this study were to evaluate the effectiveness of Program B through descriptive statistics, t-tests, and correlation analyses. The results, as presented in Table 2, demonstrate the means and standard deviations for two estimated categories of evaluation across two groups: the international pilot and the national training.

Table 2. Results of Program B evaluation

| Category | Group | N | Means | SD |
|----------|-------|----|-------|------|
| PI | IP | 35 | 3.99 | 0.96 |
| | NT | 32 | 4.52 | 0.59 |
| | Total | 67 | 4.24 | 0.84 |
| DS | IP | 35 | 4.16 | 0.97 |
| | NT | 32 | 4.57 | 0.58 |
| | Total | 67 | 4.35 | 0.83 |

* PI - Program implementation, DS - Developed skills, IP - International pilot, NT - National training, SD - Standard deviation

The findings indicate that both categories of evaluation received high ratings, with means above 4 on a 5-point Likert scale. However, significant differences were observed between the two types of courses (pilot and national training) regarding the evaluation of the courses. The pilot group provided lower ratings for the technical aspects and implementation of the courses compared to the national training group ($M=3.99/4.52$, $t(65)=-2.77$, $p=0.007$). Similarly, for the evaluation of skill development in terms of digital resilience, the pilot group rated lower than the national training group ($M=4.16/4.57$, $t(65)=-2.09$, $p=0.042$).

The lower ratings in the pilot group could be attributed to several factors. Firstly, language may have played a significant role. The international pilot phase was conducted in English, which is not the native language of the participants. This could have led to difficulties in understanding the course material and consequently affected their evaluation. Secondly, differences in instructional design and delivery between the international and national phases might have influenced participant perceptions. The national training phase, might have been better tailored to the specific needs and expectations of the participants, resulting in higher ratings.

To gain a deeper understanding of the relationship between course realization and implementation and the evaluation of acquired skills, a correlation analysis was conducted. The analysis revealed a highly significant correlation between these two categories ($r=0.89$, $p=0.000$). This suggests that higher ratings in the technical and implementation aspects of the courses were strongly associated with higher evaluations of skill development.

These findings provide valuable insights into the effectiveness of Program B in enhancing digital resilience skills among participants. While both the international pilot and national training phases were positively received, differences in participant satisfaction and perceived skill acquisition were evident. The results highlight the importance of effective course implementation and instructional design in maximizing participant learning outcomes.

Finally, this comprehensive evaluation underscores the effectiveness of Program B and provides valuable insights for future iterations and improvements.

5. CONCLUSION

Study Overview

This study focused on the implementation and evaluation of Program B, which aimed to enhance digital resilience skills among students. As part of the Erasmus+ project "Enhancing digital and psychological resilience through peer networking in the online environment in times of crisis," Program B was developed and delivered in two phases: an international pilot phase conducted in English and a national training phase conducted in Serbian language. The implementation of the program involved a hybrid model for the pilot phase, with sessions held across three partner universities, and a fully offline format for the national phase. A questionnaire was used to evaluate the effects of the program, and feedback from both phases was analyzed.

Positive Aspects of the Program:

- High Overall Satisfaction: Both phases of the program received high ratings overall, with means above 4 on a 5-point Likert scale, indicating strong participant satisfaction.
- Effective Skill Development: The high ratings for skill development demonstrate that the program was successful in enhancing digital resilience among participants.
- Strong Correlation Between Aspects: The highly significant correlation ($r=0.89$, $p=0.000$) between the technical/implementation aspects and skill development indicates that well-implemented courses effectively enhance skill acquisition.

Limitations:

- Language Differences: The pilot phase being conducted in English might have led to misunderstandings and affected the evaluations due to language barriers.
- The fact that the pilot participants are from three countries (vs. one in national training) may cause bias of the results due to cultural differences.
- Different Instructional Designs: Variations in the instructional design and delivery between

the two phases could have influenced the participants' evaluations differently.

- **Sample Size:** The relatively small sample size (N=65) might limit the generalizability of the findings to a larger population.

Future Studies:

- **Exploring Additional Factors:** Future research could explore additional factors influencing participant evaluations, such as cultural differences, individual learning preferences, and prior digital literacy levels.
- **Detailed Course Design Analysis:** Further studies could delve into specific aspects of course design that contribute to enhanced learning outcomes, identifying best practices for course implementation.
- **Longitudinal Studies:** Conducting longitudinal studies to assess the long-term impact of Program B on digital resilience skills would provide a deeper understanding of its effectiveness over time.

The overall quality of the training increased, however there are various factors making impact (course delivery mode, language, teaching methods), that cannot be easily distinguished with this sample size. However, this paper set grounds for research of this particular topic and specifically, for evaluation of the remaining training step (where students are tutors).

ACKNOWLEDGEMENT

This study was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, and these results are parts of Grant No. 451-03-66 / 2024-03 / 200132 with the University of Kragujevac -Faculty of Technical Sciences Čačak and Erasmus+ project 2021-1-RS01-KA220-HED000032204 Enhancing digital and psychological resilience through peer networking in the online environment in times of crises. This article reflects the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

REFERENCES

- [1] Boh, W., Constantinides, P., Padmanabhan, B., & Viswanathan, S. (2023). Building digital resilience against major shocks. *Mis Quarterly*, 47(1), 343-360.
- [2] Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child development*, 71(3), 543-562.
- [3] Soetekouw, L., & Angelopoulos, S. (2024). Digital resilience through training protocols: Learning to identify fake news on social media. *Information Systems Frontiers*, 26(2), 459-475.
- [4] Ang, W. H. D., Chew, H. S. J., Ong, Y. H. N., Zheng, Z. J., Shorey, S., & Lau, Y. (2022). Becoming more resilient during COVID-19: insights from a process evaluation of digital resilience training. *International Journal of Environmental Research and Public Health*, 19(19), 12899.
- [5] Ang, W. H. D., Shorey, S., Zheng, Z. J., Ng, W. H. D., Chen, E. C. W., Shah, L. B. I., et al. (2022). Resilience for Undergraduate Students: Development and Evaluation of a Theory-Driven, Evidence-Based and Learner Centered Digital Resilience Skills Enhancement (RISE) Program. *International Journal of Environmental Research and Public Health*, 19(19), 12729.
- [6] Abbott, J. A., Klein, B., Hamilton, C., & Rosenthal, A. J. (2009). The impact of online resilience training for sales managers on wellbeing and performance. *Sensoria: A Journal of Mind, Brain & Culture*, 5(1), 89-95.
- [7] Behrendt, D., Boß, L., Hannibal, S., Kunzler, A. M., Wessa, M., & Lehr, D. (2023). Feasibility and efficacy of a digital resilience training: A pilot study of the strengths-based training RESIST. *Internet interventions*, 33, 100649.
- [8] Zeng, X., Li, S., & Yousaf, Z. (2022). Artificial intelligence adoption and digital innovation: how does digital resilience act as a mediator and training protocols as a moderator?. *Sustainability*, 14(14), 8286.
- [9] DigiPsyRes team (2024). Manual: Step by Step from trainees to trainers and supporter in student peer support network. Kragujevac: University of Kragujevac and ERASMUS+ project "Enhancing digital and psychological resilience through peer networking in the online environment in times of crisis – DigiPsyReS".
<https://digipsyres.kg.ac.rs/project-results/>