International Journal of the Whole Child
2023, VOL. 8, NO. 2

The Impact of Mitigating Refugee Students' Mathematics Learning Loss on Their Resilience Levels

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Abstract

Refugee children face many difficulties on their migration routes. These challenges continue even after arriving in the destination country. It is important for the world's growing child migrant population to successfully adapt to the host country. Otherwise, there is a risk for future generations facing psychological, social, and academic challenges. Education and training play an important role in the adaptation process of children and youth. The focus of this study was to overcome the math learning losses of refugee students by changing the approach to mathematics in order to increase their resilience. For this purpose, a one-group pretest-posttest quasi-experimental design was used. Among the refugee students now living in Germany and Greece, two were Syrian and 40 were Turkish. Within the framework of the project, a two-month problem-based mathematics education program was carried out for the students. The Connor-Davidson Resilience Scale (CD-RISC-25) (2003) was administered to the refugee students at the beginning and end of the program. In addition, the students' views on the mathematics education program were taken. According to the students' views, the program was efficient, and the learning losses were mitigated. It was also found that the mitigation of math learning losses increased the resilience of refugee students significantly ($p<.01$).

Keywords: refugee children, resilience, mathematics, learning loss

Introduction and Background

In today's world, individuals are forced to migrate and relocate due to political (Polat & Kröner, 2022), war (Reed, 2018), and economic reasons (Geist & McManus, 2012), as well as natural disasters (Drabo & Mbaye, 2015).

Migrating children and young people face difficulties such as being deprived of the right to education or by experiencing educational losses. Along with the challenges of migration, the students in this study group were also affected by lockdown (Covid-19).

Because of the lockdown, when schools switched to e-learning (Betthäuser et al., 2023), refugee students, especially those who had just arrived in the destination country, either could not go to school or had to study online in a language they did not know. Thus, their education had been severely disrupted. This process caused students to experience various difficulties in learning language and basic sciences, socialization, and cultural adaptation.

In addition to these difficulties experienced by refugee students, a mathematics course is particularly difficult and is often considered as a field that cannot be easily achieved by many people (Morkoyunlu & Saltık Ayhanöz, 2021). This understanding increases the burden of refugee students even more. Research describes learning deficits are larger in math; this is particularly true for children from low socio-economic backgrounds (Betthäuser et al., 2023). Therefore, it is possible to state that migration, Covid-19, and the difficulty of mathematics in general may reduce students' resilience.

In this context, the current study, which is a product of the European Union Erasmus+ project, explores the effect of eliminating mathematics learning losses of refugee students through a different mathematics approach called Problem-Based Learning (PBL) (Albanese & Dast, 2013; Allen et al., 2011; Wood, 2003) and then, examines its effects on the refugee children's resilience levels.

Review of the Research

People have to or want to change their places for different reasons. This mobile transition from one place to another can be called migration (Dustmann & Glitz 2011). While migration is by its very nature a corrosive process, it can be said that being forced to migrate is more difficult. Being forced to migrate brings with it serious problems. These problems are divided into pre-migration-migration route and post-migration challenges (Pieloch et al., 2016).

For instance, wars (Reed, 2018) and natural disasters (Gasparrelli, 2017) are referred to as pre-migration challenges, while cultural adaptation (Bhugra & Becker, 2005) and language learning (Föbker & Imani, 2017) are characterized as post-migration challenges. However, especially for people who have to migrate illegally, the migration route is also seen as an important challenge (Demir & Aliyev, 2019).

Naturally, children are among the people who migrate or are forced to migrate. According to UNICEF (2023), 36 million children migrated to different countries in 2020. Migrant children are affected by the challenges described above. In addition, due to their location in different environments (e.g., refugee camps), refugee children also face challenges including a limitation to educational access, experience with trauma, indication needs remain unmet, and evidence of their poor socio-emotional skills (Wang et al., 2019).

These problems make the situation even more complicated, especially for school-age children. This is because children are unable to attend school regularly for a certain period of time due to the location of their accommodation. Students who attend school face learning losses in basic subjects such as mathematics due to their poor command of the host country's language.

Under normal circumstances, learning mathematics is not easy and requires struggle. Struggle is a natural part of the learning process, as it involves a student's intellectual effort to grasp

challenging mathematical concepts in line with their capabilities (Permatasari, 2016). In other words, struggle is at the center of mathematics learning (Kooken et al., 2016). In addition to the difficulty of learning mathematics, refugee students also struggle to mitigate the learning losses they have experienced due to the migration process. Learning mathematics, a subject in which prerequisite learning is important, and the process of mitigating learning losses related to this subject can be quite challenging for refugee students. This academic difficulty, in addition to psychological and social difficulties, negatively affects the resilience levels of refugee students, and therefore, these students need additional support, such as learning loss mitigation, therapy sessions, music, and sports activities.

Role of Resilience

Resilience is a term that is attracting more and more attention in the academic world. When the definition of resilience in the context of social sciences is examined, it is seen that researchers handle this concept in two different ways. The first describes resilience in the face of challenges (Denov et al., 2019; Kumi-Yeboah, 2016; Sleijpen et al., 2015); the second definition refers to academic resilience (Cinkara, 2017; Nouwen & Clycq, 2021; Sosa & Gomez, 2012). Resilience in the face of challenges is the ability of individuals to survive and overcome difficulties despite negative and stressful life experiences (Motti-Stefanidi, 2015; Sleijpen et al., 2015). In addition, when faced with challenging or threatening conditions, it is the ability of people to cope with these challenges by considering the possibilities and to adapt positively (Demir & Aliyev, 2019; Denov et al., 2019).

Academic resilience, on the other hand, involves increasing the likelihood of success in education despite the adversities caused by environmental conditions and experiences (Agasisti & Longobardi, 2017; Nouwen & Clycq, 2021). In addition, academic resilience includes elements such as establishing friendships, acquiring academic skills, and increasing school-age children’s academic performance (Gardner & Stephens-Pisecco, 2019; Sosa & Gomez, 2012). Considering the above explanations, it is critical for refugee students to cope with both life and academic challenges. Therefore, the resilience of refugee students is critical to both their academic success and their integration into society.

How do individuals develop resilience and overcome negative situations? Overcoming challenges is not the same for every individual. While some people overcome this situation by developing strategies, others require external support. Researchers concluded parental attitudes (Motti-Stefanidi, 2015; Onat, 2010) and sense of belonging (Scarf et al., 2016) have a positive effect on children's resilience.

For refugee students, learning mathematics or mitigating math deficits can play a mediating role in helping them to integrate with their peers and communicate with their teachers. This may contribute to increasing students' resilience levels.

Targeting mathematics learning losses refers to the positive characteristics that enable students to compensate for their deficiencies in mathematics and to learn and use mathematics at school and in other areas of life (Lee & Johnston-Wilder, 2017). It also increases learners' self-confidence as knowing mathematics has a value in the world (Johnston-Wilder & Lee, 2010). This situation contributes to students’ ongoing socialization and increasing friendships.

This current study examines the possible impact of mitigating math learning losses through a different mathematics teaching approach (PBL) and how this approach may impact refugee students' resilience levels (Albanese & Dast, 2013; Allen et al., 2011; Wood, 2003). It is believed that addressing refugee students' mathematics learning deficits can have a positive impact on their self-confidence, friendship relationships, and resilience in dealing with challenges and adversity.

Refugee students often face challenging living conditions and language barriers and require additional support to learn and succeed in mathematics. When the studies in the field are examined, it is observed that there are publications on increasing students' mathematical resilience (Hernandez-Martinez & Williams, 2013; Ishak et al., 2020; Kooken, 2016). The common feature of these described studies is that learning losses in mathematics reduces students' resilience and possible solutions to this situation are sought. Studies discussing the resilience of refugee students (Gruttner, 2019; Khawaja et al., 2017; Stermac et al., 2013; Wong & Yohani, 2016) describe this existing situation. In contrast, this study describes the existing problem and produces solutions to this problem with experimental methods. Therefore, it is believed this study is significant and contributes to the field.

Purpose and Research Questions

This study aims to investigate the impact of mitigating the mathematics learning loss of refugee students on their resilience through problem-based learning.

Within the scope of this purpose, the following research questions were prepared.

1. Does mitigating math learning losses of refugee students through Problem-Based Learning impact their resilience levels?
2. What are the opinions of refugee students about mitigating math learning losses through Problem-Based Learning?

Method

Research Design

In this study, a one-group pretest-posttest quasi-experimental design was used to determine the change in the resilience levels of refugee students who participated in the mathematics instruction program called Problem-Based Learning (PBL). In order to support the quantitative findings of the study, the participants' opinions about the mathematics education program (PBL) were also obtained.

A one-group pretest-posttest design is a type of quasi-experimental design in which the outcomes of the study are measured at least twice. The participant group is selected non-randomly, making it a quasi-experimental design (Johnson, 1986).

Participants

The participants of this study were refugee students who could not attend school regularly due to the difficulties of the migration process and who had math learning deficits. A total of 42 refugee

students, 21 from Germany and 21 from Greece, who originated from Turkey and Syria, participated in the study. Demographic information of the participants is presented in Table 1.

Table-1. Demographic characteristics of the participants

Variables		n	%
Gender	Female	29	69
	Male	13	31
Country	Germany	21	50
	Greece	21	50
Grade	6th	9	21.4
	7th	8	19
	8th	5	11.9
	9th	20	47.6
The parent with whom s/he lives	Mother	3	7.1
	Father	1	2.4
	Both	38	90.05

According to the table, 69% of the students were female, 47.6% were in the ninth grade and 90.05% lived with both their parents. The opinions of four volunteer students who participated in the mathematics program about the program were obtained.

Research Process

This research is a product of a large-scale European Union Erasmus+ project that aims to increase the resilience of refugee students by targeting their mathematics learning deficits. This project, which was planned as an 18-month period between 2021-2023, was realized in two phases: the preparation phase and the implementation phase.

Project activities started with seminars on measurement and evaluation of the mathematics field and usage of problem-based learning in the math field. Seven mathematics teachers participated in learning seminars conducted by Augsburg University in Bayern, Germany. Trained teachers determined the learning losses of students and trained the students in accordance.

The project process is shown in detail in Figure 1

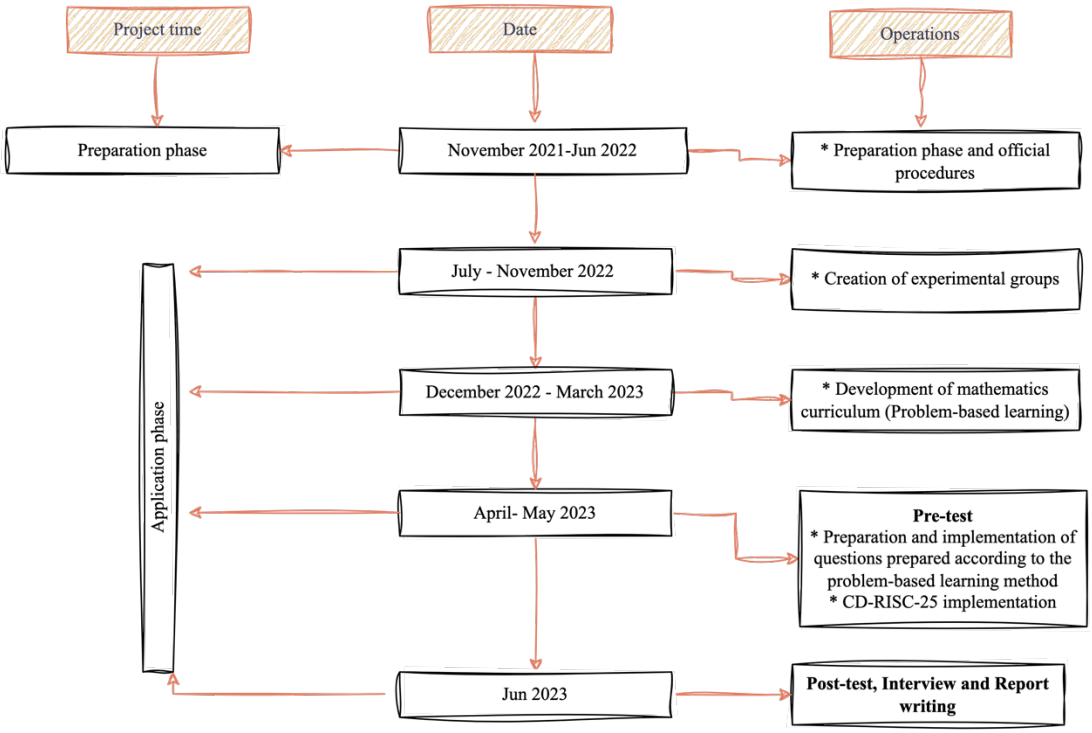

Figure-1: Project Process

The research process was prepared and supervised by the project committee. The project committee consisted of two academicians, a mathematics teacher and a psychological counselor. In this research, which is a part of the above-mentioned project "Mitigating Math-Related Learning Losses of Newly Arrived Refugee Children Through Innovative Teaching Method", a two-month mathematics education program called Problem-Based Learning was implemented. Before the implementation, a preliminary interview was conducted with the instructors and students by the project committee. As a result of the interviews, it was determined that almost all of the students who would participate in the program knew Turkish (n=38 Turkish, 2 Kurdish, and n=2 Arabic). The fact that all the students spoke Turkish was an advantage both in terms of time and cost. There was no need to prepare educational programs and applied data tools in different languages.

Mathematics Education Program

The project committee and math teachers (n=3) prepared a math exam with only numbers for each grade level (6-7-8-9) in order to identify students' math learning losses.

Before the test was administered, the students were provided with the necessary information about the test. The exam was administered in April 2023, and the mathematics program was rechecked based on the exam results. The basic approach in the mathematics education program

(PBL) is that the program should be in a language that students understand, should not include heavy topics, and should not involve reward or punishment actions as consequences.

The following points were taken into consideration in the preparation of the mathematics teaching program:

1. The program was developed based on a problem-based learning approach (PBL). One of the main arguments for choosing problem-based learning is that this learning method puts the student at the center of the learning process. Another argument is that this method aims to teach basic technical knowledge in real-life situations. In this way, it is intended to help students develop their ability to understand and solve real-world problems as well as to teach mathematics.
2. In the pre-test exam, it was determined that the students had significant deficiencies, especially in basic mathematics. For this reason, the program does not include heavy mathematics topics (e.g., functions, polynomials, complex numbers) in the program.
3. The topics included in the program are limited to basic mathematics (e.g., division, problem-solving, exponential-root numbers) to address all grade levels (6-7-8-9). This is due to the fact that most participants have not been attending school regularly for about a year. For example, the mathematics knowledge of a 9th grader is at the level of an 8th grader or a student in the middle of the 7th grade. Therefore, the first aim was to explain and reinforce basic mathematics topics.

Considering the demographic characteristics of the students and the interviews with the instructors, the mathematics education program (PBL) was implemented in German for the students in Germany and in Turkish for the students in Greece. Since two Syrian and two Kurdish students from Germany who wanted to participate in the program could speak Turkish, the Connor-Davidson Resilience Scale (CD-RISC-25) (2003) was administered to the students in Turkish, the language that all students understood, along with the mathematics exam. The implementation took place in April and May 2023. At the end of the program, as a result of consultations with the project committee, only the CD-RISC-25 scale was administered to the students as a post-test for the purpose of this study. In addition, the opinions of the volunteer students about the program were also taken.

Data Collection Tools

The Connor-Davidson Resilience Scale (CD-RISC-25)

The Connor-Davidson Resilience Scale was developed by Connor and Davidson to determine the resilience levels of individuals (Connor & Davidson, 2003). In the international literature, this scale was used for adolescents, and effective results were obtained (Bulut-Demir, 2018; Dominguez-Cancino et al., 2022). Since the scale also describes this age group, its use was approved by the project committee. The Turkish validity and reliability of the scale was conducted by Karaırmak (2010). The measurement tool is a five-point Likert scale consisting of 25 questions. The scale consists of three sub-dimensions: perseverance and personal competence (items 1, 5, 10, 11, 12, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25), tolerance to negative events (items 4, 6, 7, 8, 13, 14) and spiritual disposition (items 2, 3, 9, 20). Scale items are evaluated on a scale of 0-4, ranging from never true (0 points) to almost always true (4 points). The highest score that

can be obtained from the scale is 100 and high scores indicate that individuals with high scores have high psychological resilience. Cronbach Alpha coefficient of the scale: .92, and in the present study, Cronbach's Alpha coefficient was calculated as: .88.

Interview Form

There is only one open-ended question in the interview form prepared for the research. The interview question was prepared in consultation with a psychological counselor who is an expert in the field. The psychological counselor is someone who interacts with adolescents and is an expert on migration traumas. In this way, it was aimed to make the interview more effective for the students. Two students and their parents gave their consent for the interview to be videotaped. The other two students preferred to give their views in writing.

Data Analysis

Before analyzing the data obtained from CD-RISC-25, it was examined whether the data showed a normal distribution. For this purpose, skewness and kurtosis coefficients of the whole scale and its sub-dimensions and Kolmogorov-Smirnov test were taken into consideration. In terms of normal distribution, when skewness and kurtosis values are in the range of (+, -1), they are considered perfect, and when they are (+, -2), they are considered acceptable (George & Mallery, 2003). As a result of the analysis, it was found that perseverance and personal competence (Skewness = .182, Kurtosis =-1.07), tolerance to negative events (Skewness = .028, Kurtosis = -.466), spiritual disposition (Skewness = .395, Kurtosis = -.690) and total score (Skewness = .186, Kurtosis = -.986) showed normal distribution. In addition, when the results of the Kolmogorov-Smirnov test were examined, it was observed that the scores were in accordance with normality in both the sub-dimensions and the total scale ($p>.05$).

Accordingly, the data show normal distribution in terms of the relevant variables. Based on these results, parametric tests (t test) were used to analyze the data. In addition to parametric tests, effect size analyses were also performed on the sub-dimensions of the scale and the total score. Descriptive analysis methods, one of the qualitative research data analysis methods, were used to analyze the data obtained in the interviews.

Findings

In this part of the study, the results of the pre-posttest using the Connor-Davidson Resilience Scale (CD-RISC-25) and the data obtained from the interviews are presented.

Mitigating Math Learning Losses and Resilience

A one-group pretest-posttest experimental study was conducted to determine the effect of mitigating math learning losses of refugee students on their resilience levels. The arithmetic means and standard deviation distributions of the students' resilience levels are shown in Table 2, and the t-test and effect size values are shown in Table 3.

Table-2. Mean and standard deviation values of pre-post test scores obtained from CD-RISC-25 scale

	CD-RISC-25	Mean	N	Sd
Pre test	Perseverance and personal competence	44.76	42	9.66
	Tolerance for negative events	11.90	42	4.10
	Spiritual disposition	10.61	42	2.77
	Total	67.27	42	14.40
Post test	Perseverance and personal competence	56.68	42	13.99
	Tolerance for negative events	15.11	42	4.40
	Spiritual disposition	9.02	42	3.36
	Total	80.81	42	18.34

When Table 2 is analyzed, it is observed that the mean scores of the refugee students increased in perseverance and personal competence (Xpt = 44.76, Xpst = 56.68) and tolerance to negative events (Xpt = 11.90, Xpst = 15.11) sub-dimensions of the CD-RISC-25 scale, while the mean scores of the spiritual disposition sub-dimension (Xpt = 10.61, Xpst = 9.02) decreased. However, an increase was observed in the mean scores of the students in the whole scale (xpt = 67.27, Xpst = 80.81).

Table-3. Pre-posttest t-test and effect size results from the CD-RISC-25 scale

	CD-RISC-25	Mean	N	Sd	t	p	Effect Size Cohen's d
Pre-Post test	Perseverance and personal competence	11.92	42	12.32	-26.34	<.001	.96
	Tolerance for negative events	3.21	42	4.00	-5.19	<.001	.80
	Spiritual disposition	-1.59	42	3.32	3.11	ns	-.47
	Total	13.54	42	13.952	- 26.49	<.001	0.86

When the table is examined, the results show that mitigating math learning losses through problem-based learning increases the resilience of refugee students in the two sub-dimensions of the CD-RISC-25 scale and in the total score.

According to the data, the results obtained in the sub-dimensions of perseverance and personal competence, tolerance to negative events and total score have significant and high-level effect size. Perseverance and personal competence sub-dimension ($d = 0.96$, $p < .01$), tolerance to negative events sub-dimension ($d = 0.80$, $p < .01$), and total score ($d = 0.86$, $p < .01$) have significant, high and strong effect size. On the other hand, the results were not significant in the spiritual disposition sub-dimension.

Students' Views about the Implementation

Within the scope of the second question of the research, students were asked for their opinions about the program. Although the question was directed towards the students' opinions about the program, the students expressed a resilience process in which they had to deal with different problems in terms of language barrier and adaptation in the country they were already in. Therefore, in this part of the study, students' views on the mathematics education program were included along with other issues.

When the students' views on the mathematics education program were examined, three out of the four students who participated in this study expressed that they were very pleased that their views were taken into account. We can say that considering them as individuals and taking their opinions into account positively affected the resilience of refugee students. According to the descriptive analysis results, students' opinions were classified under three different headings: 'adaptation problem', 'language barrier', and 'satisfaction with the project.' In general, we can perceive mathematics as a boring, difficult, and complex subject under normal conditions. However, for refugee students, it becomes even more challenging, as they have to deal not only with the difficulties of mathematics but also with the problem of integration that comes with migration.

In the interviews conducted with the students, it was observed that students stated that cultural differences, dressing, and behavioral styles posed a problem in relation to the 'adaptation problem.' As a matter of fact, during the interviews we conducted on this subject, a student in the 6th grade expressed his views as follows. '*When I arrived, teachers' clothes were more formal in the country, but in Greece, teachers prefer more sporty and comfortable clothes. I can say that I had trouble getting used to this at first. Likewise, the way my classmates dressed was very different from mine. But I can easily say that both the teachers and my friends were very tolerant.'*

A seventh-grade female student in Germany expressed her feelings as follows. *'It was difficult, and it was immediately clear that I was different in the class. Neither the clothes I wore were similar to theirs nor the way I behaved.'*

Students who are trying to adapt to their new school in the host country initially have difficulties in understanding many of the lessons because they do not speak the language. Students stated that they were behind their peers and withdrawn because they did not speak the language. For example, a student from Greece commented: '*Since I came here at a young age, it didn't mean anything to me at first. Later, as I entered adolescence, I started to realize things a little more, and I realized how lonely I was; I could not communicate because I did not speak the language, and I became introverted*.'

Again, from Greece, she expressed her views as follows. '*Coming from my country to Greece turned my education life upside down. I couldn't do anything for the first two years because I didn't speak the language*.' In addition, a student from Germany who filled out an interview form about the language and the difficulty of the language expressed her views as follows:

‘*In Willkommensklasse, they taught us grammatical rules and hoch Deutsch. When I went to the regular class, I couldn't understand my friends at all because they spoke 'jugendsprache*. *So, it is not enough just to learn the language; you also need to know the daily language*. *Unfortunately, I had serious difficulties in this regard, and this lasted for a year and a half.’*

Again, in our interviews with the students, they stated that they were satisfied with this mathematics education program and that the distance between them and their peers was partially closed thanks to this program. A student from Greece expressed her views as follows: ‘*The course was good, I was very happy with the lecturers, it helped me a lot to close my gaps. Actually, it could have been a bit longer and more professional.*’

Another student, also from Greece, expressed her views as follows: ‘*The teachers' behavior towards us was good. It helped me in my math exams and in attending the class*.’

A female student participating in the program from Germany expressed her views on the project along with the learning losses caused by the Covid-19 period.

‘*Lockdown started six months after I arrived in Germany. I hadn't even learned German yet, and now I had to attend school online. The classes were very boring. I didn't know German, so I didn't understand math. Then, I would turn off the camera and not listen to the lesson. This mathematics program was very good for me. It partially compensated for my math deficiencies*.’

Another student from Germany expressed her views by comparing mathematics education in Turkey and Germany. *'Actually, when we compare the subjects, I think the math subjects in Germany are easier than the subjects in Turkey. However, since we lost a lot of time in the refugee camp, I couldn't attend a regular school for a long time. I didn't know the language very well anyway, so I fell behind a lot. But after I started this program, my math deficiencies started to decrease. My self-confidence came back. I wish it had been a little longer*.'

The views of a student from Greece were about the benefits of the mathematics education program. *'I learned a lot after attending this course. The teachers did not ask me about any problems with the exam. I learned a lot about operations here. I got a high score on the last exam, which made me very happy*.'

Students' opinions suggest that the mathematics education program should be longer and more professionally planned. In addition, while expressing their thoughts about the program, the students stated that they liked coming to the course, they were happy, and their self-confidence increased. Therefore, it is possible to state that the mathematics education program increased students' resilience.

Discussion and Conclusion

The focus of this study is to increase the resilience of refugee students from Turkey and Syria residing in Germany and Greece by mitigating their mathematics learning losses through using a different approach to mathematics, namely Problem-Based Learning. It also aims to reveal the students' views about the mathematics education program (PBL) implemented. In the study, rather than measuring the mathematics achievement of refugee students, the effect of the mathematics education (PBL) they received to mitigate their learning losses in mathematics on

their resilience levels was measured. Therefore, the study did not aim to measure students' math achievement. This can be seen as a deficiency for the current study.

It is in favor of both the students and the host country that refugee or asylum-seeking students attend school, and their education/training lives are not disrupted. Individuals are better integrated through education (Biasutti et al., 2020; Polat, 2022); the sense of achievement, learning, and recognition can contribute to increased resilience (Li, 2017).

New and challenging conditions await students who arrive in the destination country after a difficult migration path. These include adaptation problems, overcoming the language barrier, and adopting a new environment. In addition to these challenges, refugee students also face learning losses in basic subjects such as mathematics. In order to help students overcome this challenge and mitigate learning losses, school administrators often tend to start students in the lower grades. This means that students study with peers who are younger than them. This can be seen as a barrier for students to develop better friendships. Therefore, it can be said that refugee students need additional support to overcome learning losses and increase their resilience. In this study, the effect of refugee students' math learning deficits by engaging students in a Problem-Based Learning approach and exploring its impact on their resilience levels was examined.

When the pre-test and post-test arithmetic averages of the CD-RISC-25 scale of the students were examined, an increase was observed in the mean scores in the sub-dimensions of perseverance and personal competence, tolerance to negative events, and in the whole scale. However, a decrease was observed in the mean scores of the students in the spiritual disposition sub-dimension. Similarly, the results obtained in perseverance and personal competence, tolerance to negative events sub-dimension, and total score were found to be significant, and the effect size was found to be quite strong (Cohen et al., 2007). On the other hand, it was found that the results were not significant in the spiritual disposition sub-dimension. These results are in line with the purpose of the study because one of the main objectives of the study was to enable refugee students to overcome negative events and feel competent.

The feeling of learning mathematics through the Problem-Based Learning approach is effective against negative emotional states such as anxiety and helplessness in students and equips students to overcome negative situations (Lee & Johnston-Wilder, 2017). Learning mathematics encourages students to participate in school and classroom activities (Aktan, 2012). Students' participation in school and classroom activities increases their resilience (Catterall, 1998). When the students' views about the mathematics education program (PBL) were analyzed, it was found that the students expressed different difficulties as well as the problems they experienced in mathematics. These problems are the language barrier and adaptation challenges. The language barrier naturally makes it difficult to understand the mathematics course (Hernandez-Martinez & Williams, 2013). However, students expressed that they found the problem-based mathematics education program effective. According to the students' opinions, mitigating their math learning losses had a positive effect on their school exam results and closed the gap between them and their peers.

This result shows that mitigating math learning losses helps students to close the gap with their peers by improving their exam performance. Mitigating mathematics learning losses also helps

students to go to school happier and self-confident. Therefore, it is possible to state that the problem-based mathematics education program increased students' resilience.

Recommendations and Policy Implications

It is important to regard refugee students as a potential resource for their host countries. Investing in these children is also an investment in the future of the country. In the coming decades, these children will become indispensable forces in the economies of host societies and in dealing with a rapidly ageing population. The main aim of this study was to mitigate the mathematics learning losses that occur in refugee students during and after the migration process and to increase their resilience. For this purpose, a problem-based mathematics education program was developed and implemented in a small sample group. The results show that addressing math learning deficits increases students' resilience. It is, then, appropriate to take the following measures to increase the resilience of refugee students. These could include resilience-building activities such as mentoring programs, counseling services, sporting activities, and various social events.

Refugees have to cope with many difficulties until they reach their destination country; children are the most negatively affected individuals in this process. When they arrive in the destination country, children face different challenges, such as learning a new language and adapting to school. It is important not to leave children to themselves, but, rather, to support them with various activities. Therefore, it is considered that the activities mentioned above will help refugee children to cope with the challenges.

This research focuses on refugee students and math achievement and how the Problem-Based Learning approach in mathematics enhances refugee students’ levels of resilience. Future research may focus on social, emotional, and motivational resilience that may affect the lives of refugee students. In addition, the resilience of refugee students can be examined in a multidimensional way by focusing future research on the language problems they experience in schools, their experiences of being exposed to bullying or discrimination, and problems arising from their families.

Acknowledgment

I am grateful to the editor and the anonymous reviewers for their constructive feedback on this manuscript. I am also thankful to Dr. Ahmet Özcan and Dr. Ismail Demir for providing feedback on a previous version of the manuscript.

Funding

This work was supported by the European Union Erasmus + Project. The project number is “KA210-BY-21-18-27274”.

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