Counteracting the fear of mathematics through theatre: an innovative teaching methodology

Journal Title
XX(X):1–3
DOI: 10.1177/ToBeAssigned
www.sagepub.com/
SAGE

Vincenzo Rubino [1ID],
Tor-Helge Allern[3], Maurizio Bertolini[2,]
and, Elena Cangemi[2], Ove Gunnar Drageset[3]
and Simonetta Lingua[1], Nektarios Moumoutzis[5]
and Sergio Novo[4], Mona Rosseland[3]
and Claudio Tortone[1]

1 Regional documentation centre for health promotion, ASL TO3, Grugliasco, Turin, Italy
2 Social and Community Theatre Centre, University of Turin, Italy
3 Western Norway University of Applied Sciences and Nord university, Bergen, Norway
4 Asta, theatre and other arts, Covilha, Portugal
5 Laboratory of Distributed Multimedia Information Systems of the Technical University of Crete, Chania, Greece

Abstract

Objective: Fear of mathematics is common in primary and lower secondary school students and a teacher's sense of effectiveness is a determining factor. This study describes the construction of an innovative methodology for teaching math and promoting life skills through the use of classroom dramatization.

Design: Action-research with technical and qualitative and quantitative assessment tools (semi-structured interviews, questionnaires, observation grids, focus groups).

Setting: Erasmus+ project involving math teachers from Italy, Greece, Norway, and Portugal. Project code: 2018-1-IT02-KA201-048139; title: Theatre in Mathematics.

Method: A study protocol guided implementation of the technical assessment of the methodology. Math teachers and theatre actors collaborated on the composition and validation of the methodology entitled “TIM - Theatre In Mathematics”. TIM was conducted with 30 primary and lower secondary school classes in Italy. The effects on well-being and emotions in students and self-efficacy in teachers were evaluated.

Results: Italian teachers and students confirmed that TIM has transmitted mathematical content, creating a positive participatory and emotional climate in the classroom through the reinforcement of life skills. The new validated methodology, TIM, allows more than 100 drama exercises to be used to teach mathematics. TIM allows you to develop all life skills (WHO, 1993) and the main mathematical skills (communication, mathematization, representation, reasoning and argumentation). Some of the teachers, while recognizing some innovative aspects, declare that they perceive themselves to be less effective in using TIM tout court

Conclusion: The TIM methodology is a set of tools created to innovate the teaching of mathematics in the first school cycle. It is a method that promises to affect the well-being of teachers and students by enhancing life skills. Further experimental validation of efficacy is required.

Keywords: mathematics, life skills, theatre, self-efficacy, school

Introduction

A novel methodology for teaching mathematics entitled "TIM – Theatre In Mathematics" was developed and validated in two combined theatrical approaches: Mathemart (Italian) and Process Drama (Norwegian).

Classroom drama techniques can be used to create inclusive and participatory learning environments that foster the development of life skills and individual self-efficacy, as well as the skills for an active lifestyle and healthy behaviours (WHO Europe, 2019).

In 2003, the WHO published a document on efficacious, innovative methods in schools. It reported that students learn life skills better if given the chance to engage in practical activities and to critically observe their learning experiences. When students can practice skills in a protected environment, like the classroom, they are more likely to apply their skills to other life contexts.

Education systems are successful if they enable students to influence their own lives (Bandura, 2002). However, students may not learn transversal skills (life skills) if their teachers lack experience or are reluctant to adopt flexible teaching styles and alternative methodologies for teaching mathematics. These are "enabling factors", according to the *Whole School Approach* (SHE, 2019) and they are added to negative reinforcing elements, coming from the student's family sphere, from relationships between peers and from the teaching staff of the same school. When a teacher allows students to engage in role play and theatre, they can improve their life skills in the socio-relational and the cognitive dimension: critical thinking and creativity, efficacious communication and better self-knowledge (Vega, Harding, 2014; Jarrah, 2019). In addition, by interacting with their peers and experiencing an emotionally positive class atmosphere, students enter into a closer relationship with their teacher and their own feelings (Agnihotri, 2012). Finally, teachers who applied classroom dramatization stated that they were satisfied and more motivated in teaching their subject and felt that their teaching was more creative and effective (Masoum, 2013).

The teacher is the main agent of school learning, as well as a mediator of knowledge and teaching experience. Evidence for the emotional variables in learning indicates that a teacher's affective sensitivity toward a student's learning difficulties is one of the main variables that predicts the development of anxiety in students (Niss et al., 2011; Pantziara et al., 2011; Rezayat et al., 2013). A growing body of evidence for participatory teaching methods indicates that classroom dramatization can enhance the learning environment. Chaviaris and Kafoussi (2010) found that class discussion of math tasks through the dramatization of math problems can help students experience positive emotions through peer discussion.

ID **Corresponding author:**
Vincenzo Rubino, Plans and projects assistance service, DoRS Piemonte, ASL TO3, Grugliasco, Torino

The virtuous circle by which math self-efficacy and math self-beliefs reinforce one another is rooted in early school experiences. The early school years are a crucial period for young children when math anxiety typically arises, leading to misguided beliefs about learning it. Difficulty in learning math can derive from trouble with understanding the subject content and emotional difficulties (Haciomeroglu, 2019). Math skills figure foremost among life's demands in the 21st century (Butterworth, Varma, Laurillard, 2011), making successful mathematical education critical for logical reasoning in modern society. Indeed, the trouble students encounter in learning math has implications not only for their academic career but also for future employment opportunities (Bynner & Parsons, 1997; Parsons & Bynner, 2005).

In the context of math skills development in young people, the 2015 Programme for International Student Assessment (PISA) surveyed student beliefs about mathematics: mathematical self-efficacy, sense of self as a mathematician, math anxiety and engagement in math activities in and outside school. Acquisition of literacy and numeracy is one of the major priorities for cooperation in Europe. According to the ETM 2020[2], 22.2% of European 15-year-olds demonstrated insufficient math skills and 7.2% lower than the optimistic 15% estimated for 2020.

Furthermore, the 2014 Health Behaviour in School-aged Children (HBSC) data underline the need to take account of student well-being at school, especially in the transition from primary to secondary school. In their evaluation of school life, 11-year-olds rated it less positive, especially the girls, in the 2014 compared to the 2010 survey (25% vs. 35%). In addition, the percentage of boys and girls who had been bullied at least twice in the past 2 months increased across all age groups between 2010 and 2014, and particularly among 11-year-olds (from 6 to 10% among boys and from 3 to 5% among girls). There is a clear connection between school well-being and learning.

Recent studies have shown negative correlations between anxiety and math performance (Devine et al., 2012; Carey et al., 2019; Hill et al., 2016). In their study, Conroy and Elliot (2004) showed that fear of failure and anxiety on math tests are two constructs that share a common emotional-motivational structure oriented toward avoiding the threat of being judged on one's demonstration of skills.

Authors affirm that conventional teaching methods can make for passive listening and learning (ibid). Furthermore, there is a growing body of evidence that a cooperative learning environment can stimulate learning and that active involvement of students in the learning process fosters the acquisition of subject content in a conducive classroom environment (Egan, 2005, 2010; Chaviaris & Kafoussi,2005, 2010; Chaviaris et al., 2007; WHO, 2019). In fact, how the literature confirms, peer discussion plays a fundamental role in learning and the development of metacognitive skills. Starting in infancy, it contributes to the development of metacognition, perception of self-esteem, and peer group belonging-acceptance (Bonnett et al., 2017).

Coping the fear of mathematics with dramatization techniques

The construct of fear of failure in math performance described in psychology and pedagogy is closely related to the concept of math anxiety; it has been the focus of studies investigating the causes underlying its expression (Ho et al., 2000; Pantziara & Philippou, 2006).

Research into the role of emotion in education has found a positive association between emotions and aspects of learning such as the use of metacognitive strategies, metacognitive experiences, motivation, objectives, and results (Lucangeli, 2019; Caponi et. al., 2012). Metacognition refers to self-awareness of one's thinking and enables self-reflection for monitoring progress and enacting adaptive strategies.

Recent studies exploring the development of health literacy and life skills through drama techniques in primary and secondary school have found that interaction between peers and a positive classroom climate can enhance the student-teacher relationship and the ability to recognize emotions (S. Agnihotri, 2012; G. Vega, N. Harding, 2014; H. Jarrah, 2019). Qualitative evaluation (focus groups, self-assessment questionnaires) has shown that these factors are conducive to learning the theoretical notions of all school subjects (ibid).

Classroom dramatization techniques have proved effective also for teachers. Teachers who use dramatization state they are happier and more motivated in teaching their subject and that they feel more creative and effective in their teaching (Masoum, 2013).

Ozcan and colleagues (2019) have recommended that math teachers plan their lessons and educational objectives to include targeted development of cognitive skills through the use of decontextualized experiences closer to students' real life contexts. In addition to improving math self-effectiveness and problem-solving skills, such experiences may also reduce math anxiety.

Egan's innovative learning program emphasizes the importance of creating challenges for learning, so that students can develop their imagination and use it as a driver of inquiry into their surroundings. When led by their imagination and curiosity to explore a topic or a subject and when encouraged to grow their knowledge, students will be better able to distinguish fact from opinion and to transfer their knowledge and skills to real life, becoming an expert on that topic (Egan, 2010).

Objectives of research

Teaching an engaging lesson does not seem to be an easy task for math teachers. The OECD PISA survey responses (2015, 2018) by students about learning mathematics show poor interest, especially among students from certain European countries, like Italy. One of the leading causes is the difficulty (or lack of awareness) with adopting innovative teaching methods, tools, and relational styles that could stimulate interest and motivation in the study of mathematics.

The present study began with hypotheses for complex problems:

- students show low learning levels in math
- students show anxiety and rejection towards math
- there is a widespread sense of fear of math among adults in Europe
- many math teachers have a teaching style that stifles the development of metacognitive skills, creativity, and participatory learning
- the conventional school learning environment is losing effectiveness in teaching math and in fostering a climate of school well-being for both students and teachers

Starting from these problematic aspects, the working group asked itself questions that guided the action-research and the construction and validation of the TIM methodology. Below are the main objectives of the study, including the positive effects on teachers' teaching style and students' perceived well-being:

i) How can math be taught using creative techniques such as dramatization?
ii) How can a new teaching method change teaching style and improve a math teacher's self-efficacy?
iii) In what ways does classroom dramatization enhance the development of emotional, relational, and cognitive skills?

The statements in the latest version of the assessment design (2019), before the start of the COVID-19 pandemic, can be summarized in three hypotheses that oriented the present action-research:

i) Math teachers can teach basic math skills with the use of drama techniques and perceive themselves as much more efficacious. This hypothesis assumes that TIM includes drama techniques that math teachers can use with their students and that dramatization promotes learning math.
ii) TIM can be used to create an innovative learning environment and develop life skills in a participatory and novel learning space.

iii) Students express positive emotions towards math and generally feel less anxious when learning math with the TIM methodology.

These objectives formed the operational background, which guided the choice of the evaluation actions and indicators useful for answering the research questions.

Theoretical framework of the action research

The theoretical concepts framing the present action-research refer to qualitative research, theoretical models of psychological change and health promotion. To determine how use of dramatization can create an innovative math learning environment, the OECD PISA classification of mathematical skills and metacognitive processes and the World Health Organisation (WHO) guidelines (1993; 2019) for creative methodologies in the activation of participatory and collaborative processes at school were consulted, according to the recommendations of the Health Promotion School model (SHE, 2019).

Furthermore, drawing on the literature, we framed fear of math as the result of an anxious, distrustful attitude toward the subject that an individual acquires during initial school years. The persistence of negative emotions and malaise experienced by the class and the teacher and the perception of low effectiveness, which the context constantly reinforces, are the main factors predisposing to the problem (Lucangeli, 2019). Mathematical self-beliefs are another factor in scholastic failure in math performance.

To validate the ability of TIM to develop life skills, the WHO guidelines and the related psychological theories were consulted. The major source was Bandura's theory of social constructivism. The methodological framework that was used, to carry out action research, which also includes Bandura's theory, is Green and Kreuter's Precede-Proceed. It's the most widespread and used model in health promotion field, to build and evaluate projects and good practices, on multiple intervention settings. This model provided the reference for the WHO's Health Promoting Schools framework (Schools for Health in Europe [SHE] Network, 2019).

Mathematics competencies and self-efficacy

Since the TIM project was born from the collaboration of four partner countries, it was necessary to adopt a common theoretical framework of reference also with regard to the definition of domains and mathematical skills. This is how the PISA 2015 mathematical literacy framework was chosen, which adheres to Bandura's concept of self efficacy. Below is a schematic version updated to 2021. The PISA 2021 framework (Fig. 1) illustrates the reorganization of math literacy and the relevance of studying mathematics for 15-year-old students.

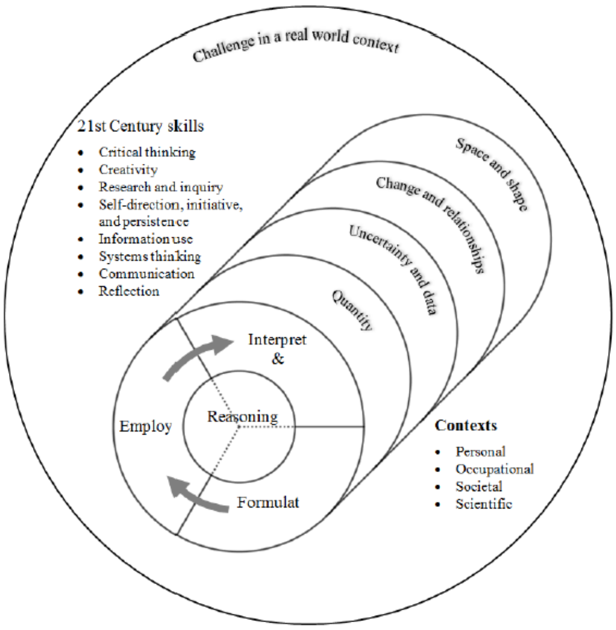


Figure 1. PISA 2021. The relationship between mathematical reasoning, problem solving (modelling) cycle, mathematical contents, context, and selected 21st century skills.

Math literacy comprises *mathematical reasoning* and *problem solving*. It plays an important role in the use of mathematics to solve real-world problems. In addition, mathematical reasoning (both deductive and inductive) goes beyond solving real-world problems to include making informed judgements about societal issues that can be addressed mathematically and about the validity of information by critically thinking through its quantitative and logical implications.

The theoretical bases for the OECD PISA surveys are grounded on the theories of individual development in a constructivist matrix (Table 1) according to which the teaching-learning process should engage active students participation in problem solving and the development of critical thinking (OECD, 2013).

Table. 1 Constructivism in learning contexts (Bandura, 1997).

Constructivism in the school involves three ways of activating learning, which at times intersect with each other: *- situated learning or anchored learning, which assumes that most learning is context-dependent and that cognitive experiences are located in authentic activities, e.g., project-based learning* *- cognitive apprenticeships or case-based learning environments, which enrich and make learning experiences more meaningful* *- social negotiation of knowledge through which students test their cognitive constructs in dialogue with each other and with society in general* *In constructivism, collaboration provides for active learning at school through peer and teacher negotiation and skills testing.*

In this sense, Bandura's theory of social learning, which is mentioned together with others in the WHO document[3], explains in part the theoretical basis for why participatory teaching techniques work. Equally relevant is Vygotsky's ecological approach, especially for problem-solving activities: "the child's social interaction and active engagement in problem solving with peers and adults is the foundation of the evolutionary mind" (Vygotsky, 1978). Schools that promote health through teaching and improve the level of educational outcomes and the learning of life skills use innovative methodologies that take into account the above notions (WHO, 2003) (Fig. 2).

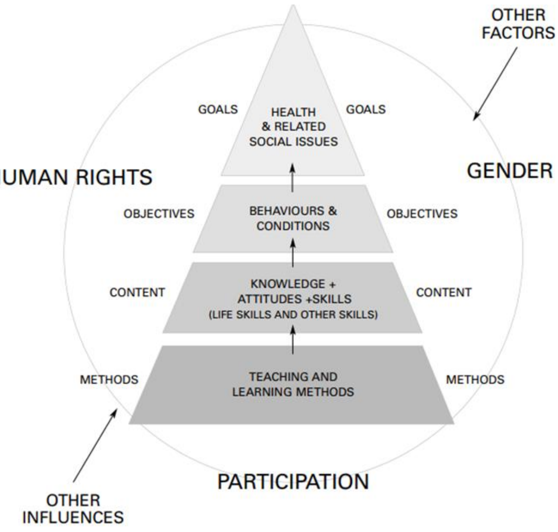


Figure 2. Pyramid for planning skills-based health education (2003)

Bandura's social learning theory is applied to the Precede-Proceed model as an explanatory approach to changing individual behaviour. Self-efficacy is a construct that can be understood as an individual's predisposing factor. Bandura's constructivist theory, with its socio-cognitive paradigm, has been used to frame skill-based health education programs (WHO, 2003) and enhance interactive and participatory teaching and learning interventions. The socio-cognitive paradigm has an "agentic" conception of psychosocial development, in which people are not the result of events but rather active subjects capable of self-regulating, self-organizing, self-reflecting and acting consciously in their own social environment (Bandura, 1986; 1997). They cognitively transform threatening situations into harmless situations, control and moderate anxiety and depression, and promote effective ways of behaviour to make a threatening environment safe.

Part of the assessment was focused on how the TIM methodology can provide math teachers with support in classroom management and build a creative, relational, and physical learning environment that fosters positive attitudes towards mathematics.

Diagnosis of fear of mathematics according to the Precede-Proceed model

In health promotion interventions for learning healthy behaviour, operational models of a concerted nature are necessary. Indeed, involving the target population (intermediate and final recipients) in the progressive stages of the research cycle, from analysis of the causes of the health problem to final evaluation of the results, ensures greater sharing of expected health expectations and adherence to the programmes and the actions put in place (Lemma, 2005). Accordingly, the phases of the research-action project followed Green and Kreuter's Precede-Proceed model (Fig. 3). The intermediate recipients were the teachers and the final recipients were both the teachers and the students. With this design, the factors for the well-being of the teachers and the students could be distinguished.

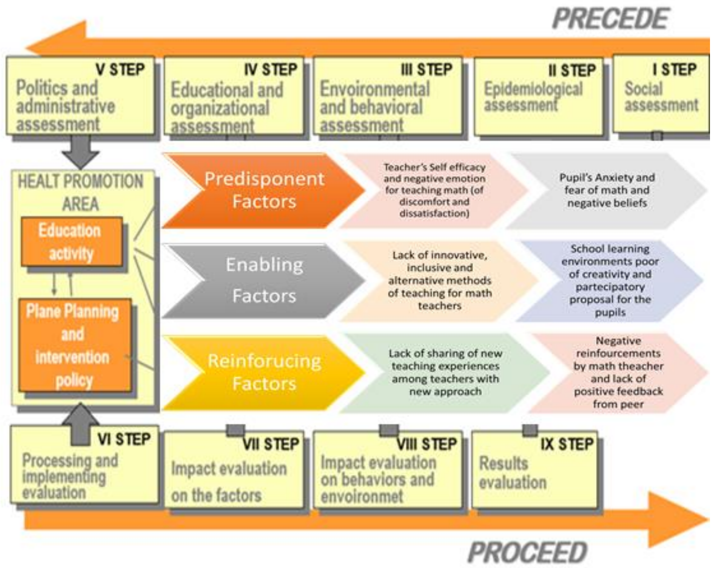


Figure 3. Educational Diagnosis in the Precede-Proceed Model.

One objective of the methodology is to improve the math teacher's role, given that the teacher is a reinforcing factor in student well-being; Green's model distinguishes three orders of variables that can influence a math teacher's own well-being.

Starting from this educational diagnosis, Green's model guided us in the choice of objectives to evaluate and monitor the process. While attention to students as final recipients of the methodology was implicit, the math teachers were the main object of evaluation during construction of the methodology and in the final evaluation.

Action-research phases, methods and tools

The research hypotheses and the data collection tools were approved and validated by the Bioethics Committee, University of Turin, in a research protocol which, however, underwent substantial changes during the study period due to the COVID-19 pandemic. Below we describe the main phases of the action-research and the reorganization of the tools and the actions to validate the TIM methodology.

The evaluation was carried out in phases of active participation by the project partners to share and validate qualitative tools and in phases of data collection and analysis by means of structured questionnaires administered by the Dors teams.

Below is a chronological reconstruction of the assessment and evaluation phases, the recipients of the evaluation, and the tools. A more detailed description of the tools is presented, with reference to the validated scales of teacher self-efficacy, student beliefs about mathematics, and mathematical anxiety scales.

Participatory evaluation tools and methods

A variety of investigation tools and techniques were used during the participatory phases of assessment and evaluation with the project partners and the teachers and the trainers (Table 2):

i. semi-structured interviews
ii. focus groups sometimes combined with SWOT analysis
iii. life skills grid (Fig. 4)
iv. observation logbook of teachers and students

A typical feature of action-research is to use a variety of tools and group work to encourage exchange between peers and discussion on a theme. Building the TIM methodology required continuous comparison between the authors of the two dramatization methodologies, the users of the methodology (math teachers and students), and the Dors team as external evaluators with a vision of the impact on wellbeing and learning. Each tool was built ad hoc based on the group's need to facilitate and direct training for the pilot TIM and the toolkit and to build the trainers' training course.

In general, during phases 1, 3 and 5 (Tab. 2) of the action research, the necessary data were collected to be able to validate the methodology within the project team. The results of these phases were shared by Dors with the project group, during phases 2, 4 and 7 (Tab, 2). During phase 8, relating to the implementation in Italian schools, the collection of questionnaires from Italian teachers and Italian students, it made it possible to further confirm and highlight the strengths and weaknesses of the methodology.

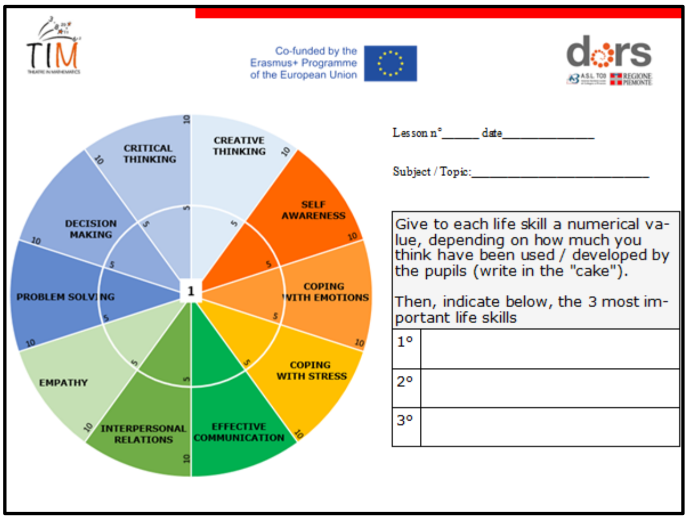


Figure 4. Life Skills Assessment Grid.

Student's questionnaire

During the testing of the TIM pilot, which took place in Greece in autumn 2019, the student questionnaire was administered and validated for students aged between 8 and 13 years. The questionnaire administered during the pilot meeting and during the Italian implementation of TIM in schools included:

i) the MeMa Anxiety Scale for Mathematics, Caponi et al. (2012). The scale consists of 30 items that investigate: math learning anxiety, math assessment anxiety, and generalized school anxiety. For the purposes of the project and to make it easier to administer the test, the battery of items relating to generalized school anxiety (6 items) was reduced.

ii) Two scales were adopted from the Mathematics and Meta-cognition questionnaire (Cornoldi et al., 2006) for a total of 15 items. One scale investigates the emotional, affective, and motivational aspects of learning math, the other investigates generic metacognitive control strategies.

iii) Two additional scales were employed to evaluate class atmosphere as perceived by students and the perception of the math teacher's affective-relational style. The one scale was taken from the Well-being in the Classroom questionnaire (M. Polito, 2000). For this 12-item scale the students were asked to express their opinion on statements about their "feeling good" in math class. The other was a set of 13 items from M. Polito's manual "Activating the Resources of the Class Group" (Erikson, 2000) and notes the construct of pedagogical caring from the student's point of view in the description of their math teacher's relational style.

iv) For the objectives of the project and to understand the changes in student perception, the post-treatment questionnaire included 15 items (open and multiple choice) that investigated the emotions that students experienced during the TIM workshop, the level of personal satisfaction, and the perception of having learned or understood mathematical concepts.

The validated scales were translated into English by a professional translator for use by the Dors team and shared with the project partners for subsequent translation and semantic validation in their respective languages by five student readers for each age group. The same procedure was adopted (also in Italy) for the single items added by the Dors team to the questionnaire administered in the post-treatment workshop/implementation of TIM.

The questionnaires were administrated to the students by assistants appointed by the Dors team and in their presence in class, in paper form or in Google format, as stipulated by the research protocol.

Teacher's Questionnaire

The entire project was focused on the development of innovative tools and skills to enhance math teaching and teacher self-efficacy. However, the research design underwent major changes during the final stages due to the COVID-19 pandemic and some of the evaluation steps involving the active collaboration of teachers. In any case, to develop the self-assessment tools and to collect qualitative data about the validity of TIM, we used two standardized scales and two observation grids built together with the project team and the teachers involved in the pilot TIM:

i) The Teachers' Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001) is a measure of self-evaluation of a teacher's own likely success in teaching (long form, 24 items). The English version of the scale was used (the validated Italian version of V. Biasi et. al., 2014 was administered in Italy).
ii) Mathematics Teaching Anxiety Scale (MTAS) originally published in Turkey (Sari, 2014). The validated English version was used in this project to correlate the anxiety of math teachers with the anxiety expressed by students and to explore correlations with teaching style (19 items)
iii) Observation logbook for recording life skills and math contents

Data collection

Data collection followed the methodological indications and the phases indicated in the research protocol approved by the Bioethics Committee, University of Turin. The protocol was signed by all project partners; it specified the tools and validated scales, the instructions for questionnaire administration and anonymization of interviewee data. Due to the COVID-19 pandemic, the data collected during implementation refer only to the Italian sample of trainers, students, and teachers. All data were stored anonymously in the Dors Documentation Centre of Health Promotion repository, which is responsible for analysis and dissemination of the results.

Data analysis

Data analysis was performed using JsStat Quantitative Data Analysis, Data Mining and Item Analyis (CTT & IRT, ver. 2.24, Roberto Trinchero) for univariate and bivariate analysis of the main variables.

Results

The action-research project involved 65 math teachers, 30 trainers (8 of which completed training in Italy), and 276 students (30 of which during the pilot carried out in Greece).
The first tangible output of the construction of the TIM methodology was the teachers' toolkit. The toolkit is a manual with more than 100 drama exercises and games proposed and tested by the trainers during the implementation of TIM in schools and during the assessment workshops. Each exercise, through class involvement, addresses at least one math concept or skill in combination with a dramatization technique and life skills to train.
Below are the results of the main factors observed during phase 8 of the action research, namely that of the implementation of TIM in Italian schools.

Mathematics and life skills

The teachers entered their observations in the logbooks and then compared in the focus groups during the workshops how much mathematics they observed (rated 0 to 2) in the drama exercises with TIM (Fig. 5).

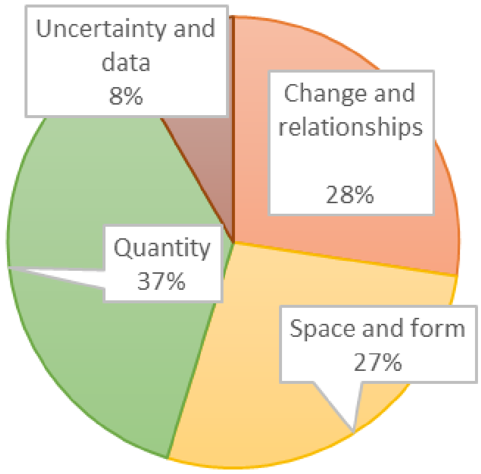


Figure 5. Domain of mathematics rated by math teachers.

The four math domains were so represented into the exercises chose from the trainers: 37% "quantity", 28% "change and relationship", 27% "space and form", and 8% "uncertainty and data". Furthermore, the teachers indicated the math skills they felt had been most thoroughly trained (Fig. 6). As illustrated in the graph, almost all mathematical competencies have been identified by teachers, with a greater focus on "communication", "mathematization", "representation" and "reasoning and argumentation".

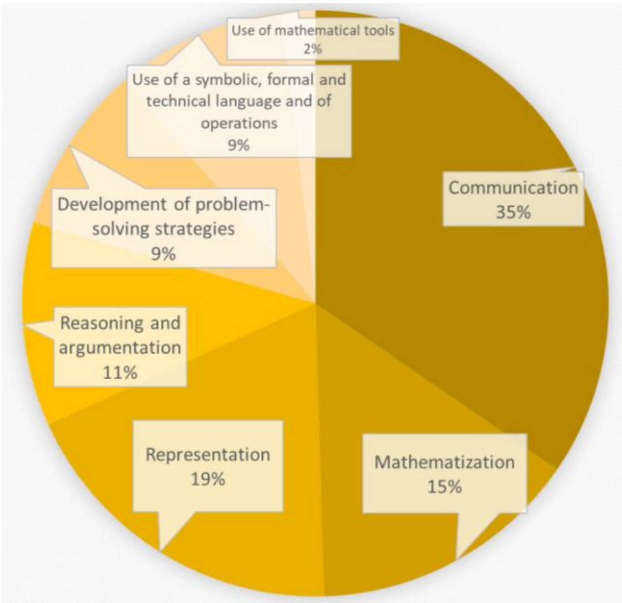


Figure 6. Mathematical processes observed by math teachers.

The teachers rated life skills (score 1 to 10) by real perceived use and then ranked the first three they thought most important in each exercise (Fig. 7).

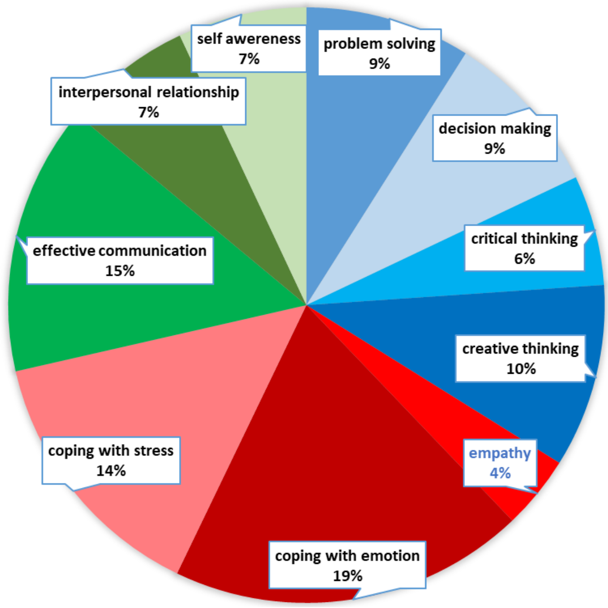


Figure 7. Life skills in TIM perceived by math teachers.

About the life skills (Fig. 7), the teachers stated that TIM, by means of a variety of drama techniques, allows for the development of emotional (37%), cognitive (34%), and relational life skills (39%). In particular, the Italian implementation prevailed the activation of coping of emotions (19%), the effective communication (15%), the coping with stress (14%) and the creative thinking (10%) and to follow all the others with lower scores.

Finally, the Italian teachers provided final feedback on the perceived effectiveness of the TIM methodology. Response to the use of TIM was overwhelmingly favourable (86% vs. 14%) (Fig. 8). The main aspects on which the Teachers provided an unanimous positive feedback (100%) were: activation of collaborative learning, development of socio-relational skills and creation of a positive class climate. Instead, looking at the aspects that have received negative feedback, the teachers stated that TIM does not directly meet their learning needs (60%) or provides useful tools to assess the progress of learning (53%).

"In my opinion, TIM..."	AGREE - %	DISAGREE - %
1 It helps me to meet my priority learning needs.	40	**60**
2 It has a consistent structure.	**87**	13
3 It fosters the development of math skills.	**87**	13
4 Give me new ideas for my lessons.	**93**	7
5 It allows for active learning in the classroom.	**93**	7
6 It allows for collaborative learning in the classroom.	**100**	0
7 It offers innovative teaching opportunities.	**93**	7
8 It allows for long-term evaluation.	47	**53**
9 It involves different teachers in the same school.	**80**	20
10 It fosters the development of cognitive life skills.	**87**	13
11 It fosters the development of emotional life skills.	**87**	13
12 It fosters the development of socio-relational life skills.	**100**	0
13 It fosters teaching in a multicultural and multilingual classroom.	**87**	13
14 It is a new, individualized approach to learning.	**67**	33
15 It allows for the teaching of key European skills	**87**	13
16 It fosters a positive classroom climate between teacher and students	**100**	0

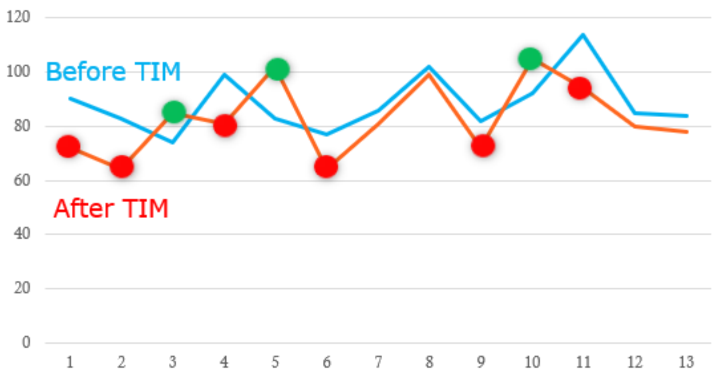
Figure 8. Strengths and weaknesses of the TIM methodology.

Teachers' self-efficacy

Only 13 TIM teachers completed implementation of TIM; their data were entered in the data analysis. The figures and tables below present the results of the teacher's self-efficacy scale (SAED, Di Biasi, 2014), with the scores of the three indicators that make up the scale. The test was administered before and after implementation of TIM. The teachers were asked to rate "*how much can use of the TIM methodology facilitate you in* ...".

The aggregated score was obtained from the responses: *"I don't feel effective" (range 0–48); "I feel effective enough" (range 49-72); "I feel very or completely effective" (range 73-120).*

The average group score before treatment was 89 and 83 after treatment (Fig. 9).



Case	PRE TEST CS index	PRE TEST SI index	PRE TEST GS index	TOT	POST TEST CS index	POST TEST SI index	POST TEST GS index	TOT
Female	25	35	30	90	29	18	25	**72**
Male	28	26	29	83	25	24	15	**64**
Male	25	26	23	74	32	25	28	85
Female	36	30	33	99	31	24	26	**81**
Female	29	25	29	83	36	32	34	102
Male	28	23	26	77	24	20	20	**64**
Male	31	26	29	86	29	26	26	81
Female	37	33	32	102	35	30	34	99
Female	31	25	26	82	28	23	21	**72**
Female	35	28	29	92	40	30	35	105
Female	40	34	40	114	33	30	31	**94**
Male	31	27	27	85	28	24	28	80
Female	32	26	26	84	29	22	27	78
	Average			89	Average			83

Figure 9. Teacher self-efficacy (SAED, Di Biasi, 2014).

After experimenting with TIM, imagining to use this methodology with their students, three teachers declared that they felt more effective in teaching mathematics than the pre-test scores (scores 85, 102 and 105). Instead, six teachers said they felt less effective (scores 64, 72, 81). In this last group, a teacher, although less optimistic, obtained a higher score than the group average (score 94).

Satisfaction questionnaires were administered to the students who participated in the Italian TIM study arm. They were asked to express their opinion about: 1) their relationship with the TIM trainer; 2) the emotions they experienced; 3) their learning mathematics and geometry notions. A total of 244 questionnaires were collected; 22 students refused consent to complete the questionnaire.

The sample consisted of 14 classes from eight comprehensive schools (Table 3). The average age was 10.6 years (range 7-14, modal 11 years).

Table 3. TIM implementation in the sample of Italian classes.

	Female	Male	Tot.
Secondary - first grade school classes	90	80	170
Primary School classes	37	37	74
Tot.	127	117	**244**

Data analysis was performed using analysis of variance (ANOVA) and simple univariate analysis. For the responses on the 13 item scale (trainer attitude toward students), the scores were aggregated into a trust in the trainer index that expressed the attitude of welcome and trust experienced by students in their relationship with the TIM trainer. The scores were aggregated in three ranges:

Score 1-12 - little trust in the trainer
Score 13-24 - some trust in the trainer
Score 25-36 - a lot of trust in the trainer

Nearly all students (94%) expressed "a lot of trust" in the TIM trainers and none gave a score less than 15.

The results of ANOVA for the presence or absence of a significant relationship with the unordered categorical variables sex (male, female), school level (primary or first grade secondary) and trainer (Table 4 and Fig. 10; Tables 5 and 6) are presented bel

Table 2. Phases, methods, tools, and subject in the validation of TIM.

1) C1 Meeting: Mathemart Technical Assessment		
Objectives - Assess the drama characteristics of the Italian approach - Assess the mathematical notions taught in Mathemart - Assess the life skills developed through the use of Mathemart	**Methods and tools** - Meeting C1 - Mathemart theatrical workshop (5 days) - Semi-structured interview with Maurizio Bertolini - Review of the literature - Focus group - Participatory observation of life skills evaluated with a qualitative grid	**Subjects involved** - TIM project team, math teachers, and guest actors in the meeting, health promoter - Maurizio Bertolini (SCT Centre- Corep)
- **2) Qualitative analysis of C1 data**		
Objectives - Describe the main math notions taught and the improvement in main life skills after Mathemart - Orient the project team to select the technical part of Mathemart for incorporation in the methodology	**Methods and tools** - Single variant data analysis with JsSTAT and C1 qualitative data return report - Qualitative mini-report shared with partners	**Subjects involved** Dors evaluation team
3) C2 Meeting: Process Drama assessment		
Objectives - Asses the drama characteristics of the Norwegian approach - Assess the mathematical notions taught in Process Drama - Assess the life skills developed through the use of Process Drama	**Methods and tools** - Meeting C2 – Process Drama theatrical workshop (5 days) - Semi-structured interview with Tor-Helge Allern and Ove Gunnar Drageset - Review of the literature - Focus group	**Subjects involved** - TIM project team, math teachers, and guest actors in the meeting, health promoter; - Tor-Helge Allern and Ove Gunnar Drageset

	- Participatory observation of life skills evaluated with a qualitative grid	(HVL)
4) Qualitative analysis of C2 data collected		
Objectives - Describe the main math notions taught and the improvement in main life skills after Process Drama - Orient the project team to select the technical part of Process Drama for incorporation in the methodology	**Methods and tools** - Single-variant data analysis with JsSTAT and C2 qualitative data return report - Qualitative mini-report shared with all partners	**Subjects involved** Dors evaluation team
5) Theoretical validation of the two approaches to dramatization and composition of the pilot TIM methodology		
Objectives - Describe how TIM can be used to teach mathematical notions, theories, and exercises by means of a novel dramatization method - Describe the life skills that can be developed with the use of TIM at school - Compose the pilot TIM - Compose a draft of trainer's TIM skills	**Methods and tools** - Literature review of the validity of classroom dramatization for teaching mathematics - Literature review of the validity of classroom dramatization for developing life skills at school - Discussion of C1 and C2 assessment results	**Subjects involved** Dors evaluation team and project partners
6) C3 Meeting: Assessment of piloted TIM methodology		
Objectives - Test the TIM methodology (theatre and mathematics) - Evaluate the impact of the methodology on students (positive emotions and perceived well-being) - Evaluate the strengths and weaknesses of the methodology (life skills, implementation) - Assessment of teachers' competences	**Methods and tools** TIM workshop with students involved in piloted TIM methodology Validated scale to assess mathematics anxiety and metacognitive competencies of students Student and teacher observation logbook Focus group with teachers Satisfaction questionnaire for teachers	**Subjects involved** TIM project partners 30 Greek students 35 Greek observing teachers
7) Qualitative analysis of C3 data		
Objectives - Describe the focal points of mathematics that TIM has incorporated in dramatization - Verify that TIM can be used to train life skills - Evaluate appreciation of TIM by students and observer teachers - Identify the strengths and weaknesses in TIM implementation - Build a skills grid for using TIM	**Methods and tools** Univariate and bivariate analysis and simple correlations performed with JsSTAT Analysis of indices of mathematics anxiety and metacognitive skills performed using ME-MA software Interim Evaluation Report TIM toolkit reading	**Subjects involved** Dors evaluation team
8) Implementation of TIM in Italy		
Objectives - Validate the TIM methodology for use at school based on perception and judgment by math teachers and students	**Methods and tools** Validated questionnaires, pre-and post-treatment administered to students and teachers Teachers' logbook	**Subjects involved** 246 Italian students (age, 8-14 years) 30 Italian math teachers

Table 4. Correlation between index of trust in TIM trainer and student sex.

Index of Level of trust in TIM trainer x Sex				
Sex	Student	Average	Deviance	Standard deviation
Female	127	30.99	1468.99	3.4
Male	117	29.75	1587.81	3.68
Total	244	30.4	3150.44	3.59
Eta square = 0.03. Significance = **0.007**. Effect size: Cohen's "d" = 0.35. Point-biserial correlation (rYl) = 0.17.				

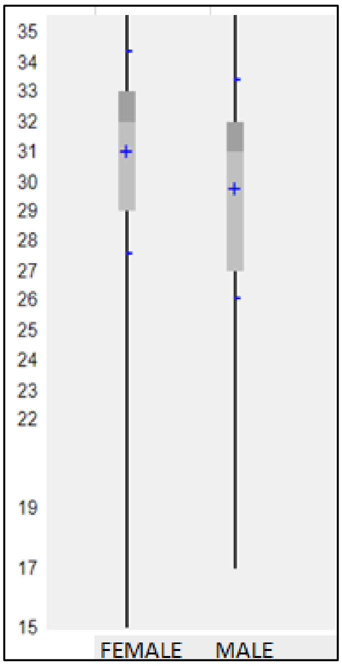


Figure 10. Correlation between index of trust in TIM trainer and student sex.

Table 5. Correlation between index of trust in TIM trainer and student sex.

Index of Level of trust in TIM trainer x School Level				
School level	Student	Average	Deviance	Standard deviation
First Grade Secondary School	170	30.41	2107.18	3.52
Primary School	74	30.36	1043.15	3.75
Total	244	30.4	3150.44	3.59
Eta square = 0. Significance = 0.926. Effect size: Cohen's "d" = 0.01. Point-biserial correlation (rYl) = Nan.				

Table 6. Correlation between index of trust in TIM trainer and trainer.

Index of Level of trust in TIM trainer x TIM Trainer				
Trainer	Student	verage	Deviance	Standard deviation
T1	34	29.91	364.74	3.28
T2	26	31.31	315.54	3.48
T3	29	29.83	404.14	3.73
T4	53	29.74	754.3	3.77
T5	84	30.75	1109.75	3.63
T6	18	31.22	117.11	2.55
Total	244	30.4	3150.44	3.59
Eta square = 0.03 Significance = 0.257. Effect size: Cohen's "d" = Nan. Point-biserial correlation (rYl) = Nan.				

Feeling and mathematics

The final section of the students' satisfaction questionnaire explored general satisfaction with the TIM methodology through explicit items investigating the emotions most perceived during math lessons and the perception of having learned notions of math and geometry. The figures below present the results grouped by positive (Fig. 11) and negative feelings (Fig. 12).

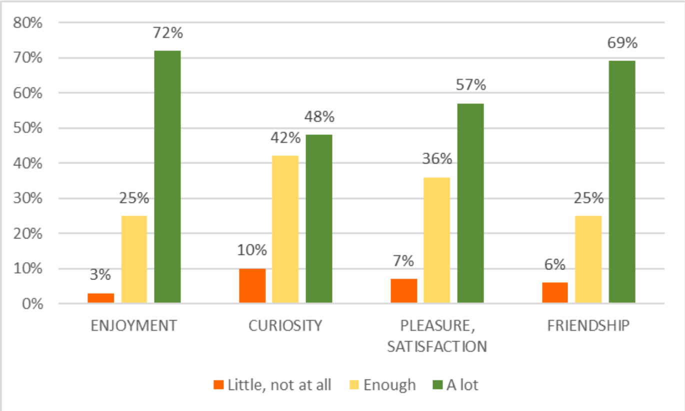


Figure 11. Positive feelings perceived by students learning mathematics with TIM.

The Italian students stated that the math lessons with TIM elicited positive emotions (enjoyment 72%, curiosity 48%, pleasure and satisfaction 57%, friendship 79%) and did not activate negative emotions such as sadness (95%), anxiety (67%), shame and embarrassment (56%). About 94% of students stated that they felt comfortable with the TIM teachers-trainers, with the girls rating higher than the boys (p=0.007).

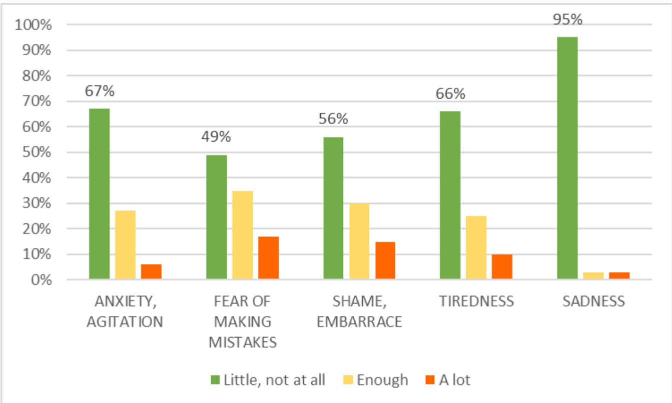


Figure 12. Negative feelings perceived by students while learning mathematics with TIM.

Student responses to two items on learning (math and geometry), which completed the satisfaction questionnaire, are reported below (Table 14). The 79% of the total said they learned something new in mathematics, while only 42% said they learned something new in geometry.

Table 14. Learning about mathematics or geometry with TIM.

Learning with TIM	YES	NO
Did you learn anything about mathematics?	**79%**	21%
Did you learn anything about geometry?	42%	**58%**

Discussion

The data corroborate the assumptions of efficacy taken from the literature. The math teachers who participated in the implementation of TIM in Italy stated that they found the method useful for framing math exercises and contents in relation to the four main mathematics domains (OECD PISA 2015), especially "quantity" (37%), "change and relationship" (28%) and "space and form" (27%). While the toolkit contains more than 100 exercises, many of which the teachers-trainers did not have the opportunity to fully experiment due to time limitations of the courses and the restrictions imposed by the COVID-19 pandemic. The teachers-trainers selected the exercises they wanted to use with students and teachers, resulting in TIM workshops very different from one another.

TIM was found to influence the development of math literacy skills. In this phase of validation of the methodology, exercises were chosen that activated communication (35%), representation (19%), mathematization (15%), and reasoning and argumentation (11%). The teachers stated that the methodology promises to be effective (86%), especially in activating classroom collaboration, socio-relational skills, and creating a positive climate that fosters creative insights and ideas for implementing active learning with students (93-100%). However, the teachers also stated that TIM does not directly meet their training needs (60%) or provide useful tools for evaluating learning progress (53%).

The teachers stated that TIM, by means of a variety of drama techniques, allows for the development of emotional (37%), cognitive (34%), and relational life skills (39%). Furthermore, the Italian students stated that the math lessons with TIM elicited positive emotions (enjoyment 72%, curiosity 48%, pleasure and satisfaction 57%, friendship 79%) and did not activate negative emotions such as sadness (95%), anxiety (67%), shame and embarrassment (56%). About 94% of students stated that they felt comfortable with the TIM trainers, with the girls rating higher than the boys (p=0.007).

Participation in the TIM workshops had different effects on this small sample of trainers, which precludes drawing conclusions. Nonetheless, the individual scores on the teacher's self-efficacy scale merit comment (Fig. 9): the group mean self-efficacy score decreased; the perception of effectiveness was significantly increased in three teachers and decreased in six teachers compared to the group average.

This result suggests that the use of creative methodologies that diverge from conventional math teaching styles can generate a loss of effectiveness in the initial impact, just as it can activate personal resources.

Study Limitations

The major limitations stem from the restrictions imposed by the COVID-19 pandemic, especially during the implementation phase in schools and the impact on the four partner countries. Only Italy managed to set up TIM workshops in schools. This meant that not enough data could be collected to draw meaningful conclusions from some factors, such as teacher self-efficacy. The second major limitation was time. Each trainer was able to conduct only 3 or 5 math lessons with TIM and only some of the exercises. Students and teachers worked with TIM for 3 or 4 weeks.

Finally, it was not possible to train the teachers who supported the trainers during implementation, which meant that the teachers had only a partial view of how the methodology works because they assisted the trainers during math class. This factor influenced the perception of TIM effectiveness in the field.

Conclusion

TIM has the potential for improving efficacy in pedagogical (evidence-based education) and health interventions (evidence-based health promotion). To do this, it will be necessary to design training courses tailored to the learning needs of students according to school level and curriculum. Likewise, math teachers will need to be adequately trained so that they can effectively adapt the toolkit exercises to their experience and confidence with their class.

It is still necessary to explore and describe in the long term whether the use of TIM can have a positive effect on the development of meta-cognition, personal beliefs of students about math, and their math literacy. Finally, since one goal of TIM is to innovate the teaching style of mathematics, it will be necessary to explore which dimensions of teacher self-efficacy are positively influenced and how a math teacher trained in the use TIM can apply it to the benefit of students compared to conventional math teaching.

Funding

Dors Piemonte received funding for evaluation of the Erasmus+ project entitled "TIM - Theatre in Mathematics", stipulated with Agreement no. 2018-1-IT02-KA201-048139.

Notes

[2] Education and Training – Monitor 2020; ec-europa.eu/education/monitor

[3] Skill for Health: Skills-based health education including life skills, WHO, 2003

References

- Agnihotri S. et.al., "Two case study evaluations of an arts-based social skills intervention for adolescents with childhood brain disorder", Developmental Neurorehabilitation, 15(4):284–297, August 2012
- Arslan C. et. Al., "A study on mathematical literacy self-efficacy beliefs of prospective Teachers", Istanbul University Education Faculty Elementary Education Department, Procedia - Social and Behavioral Sciences, 46:5622 – 5625, 2012
- Bonnett V. et al., "Mathematics, mastery and metacognition: how adding a creative approach can support children in maths", Educational and Child Psychology 34(1)83, March 2017

- Carey E et al., “Understanding Mathematics Anxiety Investigating the experiences of UK primary and secondary school students”, Nuffield Foundation, University of Cambridge, March 2019
- Caviola S, Carey E, Mammarella IC, Szucs D., “Stress, Time Pressure, Strategy Selection and Math Anxiety in Mathematics: A Review of the Literature”, Front Psychol, Sep 1;8:1488, 2017
- Chaviaris P, Kafoussi S., “Developing Students’ Collaboration in a Mathematics Classroom through Dramatic Activities”, International Electronic Journal of Mathematics Education, Vol. 5, No. 2, July 2010
- Egan K., Madej K., “Learning in depth: students as experts”, Education Canada, Vol. 49 (2), 2010
- Fisher U. et al., “Interventions Supporting Children's Mathematics School Success: A MetaAnalytic Review”, European Psychologist, Vol. 18, No. 3, January 2013
- Fancourt D., Finn S., “HEALTH EVIDENCE NETWORK SYNTHESIS REPORT 67. What is the evidence on the role of the arts in improving health and well-being? A scoping review”, W.H.O. Regional Office in Europe, 2019 https://www.quotidianosanita.it/allegati/allegato8665990.pdf
- Fleming J. Et. Al., “Social and emotional learning in teacher preparation standard”, in “Building academic success on social and emotional learning”, Teachers College Press, 2004
- Galiano, MJJ, et al., “Math anxiety and math performance in children: The mediating roles of working memory and math self-concept”, British Journal of Educational Psychology, 2017
- Griebler, U., Rojatz, D., Simovska, V. and Forste R., “Evidence for the effects of student participation in designing, planning, implementing and evaluating school health promotion: A systematic literature review”, Ludwig Bolzman Institute, Working paper 12, 2012.
- Harding N., Vega G., “Practicing for life: Creative Drama and Role-Playing in the Classroom”, The International Journal of Diversity in Education, Vol. 13, 2014
- Hartati A.S. et.al., “The Role of Life Skills Training on Self-Efficacy, Self Esteem, Life Interest, and Role Behavior for Unemployed Youth”, Global Journal of Management and Business Research, Vol. 10, Issue 1 (Ver 1.0):132, February 2010
- Haciomeroglu, G., “The relationship between elementary students’ achievement emotions and sources of mathematics self-efficacy”, International Journal of Research in Education and Science (IJRES) 5(2):548-559, 2019
- Huang X. et al., “Impact of math self-efficacy, math anxiety, and growth mindset on math and science career interest for middle school students: the gender moderating effect”, European Journal of Psychology of Education, p. 1-20, Sept. 2018
- Ihechukwu B. et al., “Causes and Solutions of Mathematics Phobia Among Secondary School Students”, Research on Humanities and Social Sciences, Vol .6, No. 20, 2016.
- Jarrah H.Y., “The impact of using Drama in education on Life Skills and Reflective Thinking”, Al-Ain University, Abu Dhabi, UAE, 2019
- Karademir CA, et al., “Secondary school students’ (11-14 years) effective input characteristics for mathematics, self-regulation skills and self-esteem”, European Journal of Education Studies, No. 5 (9):264-287, 2019
- Kazemi R, et al., “The effectiveness of life skill training on self-esteem and communication skills of students with dyscalculia”, Procedia - Social and Behavioral Sciences, 4th World Conference on Psychology, Counselling and Guidance WCPCG-2013. 114: 863–866, 2014
- Kimberly L. et. Al., “Social Competence Intervention Program: A Pilot Program for the Development of Social Competence”, Journal of Psychotherapy in Independent Practice, Vol. 1(4) 2000.
- Lucangeli Daniela, “Cinque lezioni leggere sull’emozione di apprendere”, Erickson, 2019
- Madjar N, et al., “Predictors of developing mathematics anxiety among middle-school students: A 2-year prospective study”, International Journal of Psychology. Volume 53, Issue P:426-432, 6 December 2018

- Marino E. et al., “Emotive intelligence and self efficacy in a group for teachers”, International Journal of Development and Educational Psychology, University of Turin, No. 1, Vol. 2, 2013
- Marat D., “Assessing mathematics self-efficacy of diverse students from secondary schools in Auckland: Implications for academic achievement”, Issues In Educational Research, Vol 15, Unitec, New Zealand, 2005
- Masoum E, et al., “A Study on the Role of Drama in Learning Mathematics”, Mathematics Education Trends and Research, 1-7, 2013
- Mill F., “Maths anxiety in primary and secondary school students: Gender differences, Developmental changes and anxiety specificity”, Learning and Individual Differences. Vol. 48:45-53, May 2016.
- Mogens Niss & Tomas Højgaard, a cura di, “I, om og med matematik og fysik. Competencies and Mathematical Learning”, Department of Science, Systems and Models, Roskilde University, IMFUFA TEKST, No. 485 – 201, October 2011
- Muafi A. et al., “The Role of Life Skills Training on Self-Efficacy, Self Esteem, Life Interest, and Role Behavior for Unemployed Youth”, Global Journal of Management and Business Research Vol. 10 Issue 1 (Ver 1.0):132, February 2010
- Muis KR, et al., “The role of epistemic emotions in mathematics problem solving”, Contemporary Educational Psychology, Volume 42:172-185, July 2015.
- Moustafa AA. Et al., “Mathematics, anxiety, and the brain”, Rev Neurosci No. 24;28(4):417-429, 2017
- Nurlu Ö., “Investigation of teachers’ mathematics teaching self-efficacy”, International Electronic Journal of Elementary Education, [S.l.], Vol 8, No. 1:21-40, Aug. 2017
- Ozcan Z., Gumus a., ”A modeling study to explain mathematical problem-solving performance through metacognition, self-efficacy, motivation, and anxiety”, Australian Journal of Education 0(0) 1–19, Australian Council for Educational Research, 2019
- Pantziara M, Philippou G., “Fear of failure in mathematics. What are the sources?”, Cyprus Pedagogical Institute, University of Nicosia, January 2011
- Ramirez G. et al., “On the relationship between math anxiety and math achievement in early elementary school: The role of problem solving strategies”, J Exp Child Psychol, Jan;141:83-100, 2016
- Reed H. et al., “Self-Beliefs Mediate Math Performance between Primary and Lower Secondary School: A Large-Scale Longitudinal Cohort Study”, Frontline Learning Research, Vol 3:36-54, 2015
- Ruzlan MA et al., “Indications of teachers’ intention to inculcate soft Skills in primary school mathematics classrooms”, Proceedings of Research World International Conference, Muscat, Oman, May 2016
- Saraanen, T., "Processes and outcomes in school health promotion: engaging with the evidence discourse", Health Education, 112:3, 2012.

http://www.cdc.gov/healthyYouth/AdolescentHealth/pdf/connectedness administrators.pdf

- Siegle D. et.al., “Increasing Student Mathematics Self-Efficacy Through Teacher Training”, Journal of Advanced Academics, University of Connecticut, Vol. 18, No. 2: 278–312, Winter 2007.
- Solorzano J et al., “Soft Skills and Advantages for Learning Mathematics at an Early Age”, Indian Journal of Science and Technology, Vol 11(45), 2018
- Tornare E et al., “Children's emotions in math problem solving situations: Contributions of self-concept, metacognitive experiences, and performance”, Learning and Instruction of Educational and Child Psychology, Volume 39:88-96, October 2015
- Veltro F. et.al., “Valutazione dell’impatto della nuova versione di un manuale per la promozione del benessere psicologico e dell’intelligenza emotive nelle scuole con studenti di età 12-15 anni”, Il Pensiero Scientifico Editore, 2019
- Vilaca T. et.al., “SHE SCHOOL MANUAL 2.0. A Methodological Guidebook to become a health promoting school”, Ed. Schools for Health in Europe Network Foundation (SHE), Haderslev, Denmark, 2019
- Zan R., “The Montana Mathematics Enthusiast”, Monograph 3:157-168, 2007

- Stoehr KJ. et al., “Mathematics Anxiety: One Size Does Not Fit All”, Journal of Teacher Education, Vol 68, Issue 1, 2017 May.
https://www-ncbi-nlm-nih-gov.bvs.clas.cineca.it/pubmed/28157694
- Zeynep C.¸ Aynur E., “A modeling study to explain mathematical problem-solving performance through metacognition, self-efficacy, motivation, and anxiety”, Australian Journal of Education 0(0) 1–19, 2019
- Social Community Theatre Centre, “Mathemart” http://www.socialcommunitytheatre.com/en/projects/mathemart/
- “Council of 21 November 2008 on preparing young people for the 21st century: an agenda for European cooperation on schools”, Official Journal of the European Union, 2008/C 319/08
- Le-MATH. Learning mathematics through new communication factors, 2012-2014, www.le-math.eu
- Manuale Life Skill per la scuola secondaria di primo grado, Regione Lombardia, 2010
- Manual of Scripts for MATHheatre. A collection of theatre scripts submitted for the Theatre. Play writing competition on the theme of Mathematics, 2013.
- Mathematics Education in Europe: Common Challenges and National Policies, Education, Audiovisual and Culture Executive Agency, 2011 https://publications.europa.eu/en/publication-detail/-/publication/3532f22d-eea2-4bb2-941b-959ddec61810/language-en
- Pisa 2015 Focus Results, OECD 2018: www.oecd.org/pisa
- Skills for Health. Skills-based health education including life skills: An important component of a Child-Friendly/Health-Promoting School, 2003,
https://apps.who.int/iris/handle/10665/42818
- School health promotion: evidence for effective action, 2013,
https://www.schoolsforhealth.org/sites/default/files/editor/fact-sheets/she-factsheet-2-school-health-promotion-evidence.pdf
- Focus Paper HBSC Italia 2014:
http://www.hbsc.unito.it/it/index.php/pubblicazioni/focusnpapers.html
Promuovere la salute a scuola, 2010
https://www.dors.it/documentazione/testo/201209/PHiS_A&E_ITALIAN_FinalWeb(1).pdf
(versione originale: https://www.iuhpe.org/index.php/en/iuhpe-thematic-resources/298-on-school-health)
- Education and Training – Monitor 2018, Luxembourg: Publications Office of the European Union, 2018, ec.europa.eu/education/monitor
- Gazzetta Ufficiale dell’Unione Europea: Conclusioni del Consiglio e dei rappresentanti dei governi degli Stati membri riuniti in sede di Consiglio, del 21 novembre 2008 — Preparare i giovani per il XXI secolo: un ordine del giorno per la cooperazione europea in materia scolastica (2008/C 319/08): https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:52008XG1213(05)&from=IT

Useful websites

BHSC: http://www.hbsc.org/; http://www.hbsc.unito.it/it/

DORS: https://www.dors.it

IUHPE: https://www.iuhpe.org/

SHE NETWORK: https://www.schoolsforhealth.org

WHO IRIS: https://apps.who.int/iris/

OECD: https://www.oecd.org

COREP: https://www.corep.it

SCT: http://www.socialcommunitytheatre.com/

HVL: https://www.hvl.no

TIM: https://www.theatreinmath.eu

TUC: https://www.tuc.gr

ASTA: aasta.info