A guidebook for the integration of financial literacy to mathematics courses

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Abstract: Turkey needs to take serious steps for financial literacy, which has become one of the most trending topics in the world for the education system. Considering the strong interaction between financial literacy and mathematics education, the purpose of the study is to respond to the needs within the field of mathematics education in Turkey, without interfering with the curriculum, through a guidebook for grades one to eight. The tasks that are the focal point of the guidebook are presented for the teachers along with knowledge on children's financial understanding. The tasks were designed according to task design parameters as well as the spiral approach which is used for the curriculums of Turkey as well. Tasks organise learning activities and guide teaching and learning processes, and they also include background on the design of the tasks. It is expected to lead a soft integration for financial literacy education in Turkey.

Keywords: mathematics education; financial literacy; financial education; children's financial understanding; guidebook; integration.

Reference to this paper should be made as follows: Ozkale, A. and Aprea, C. (2024) 'A guidebook for the integration of financial literacy to mathematics courses', *Int. J. Learning and Change*, Vol. 16, No. 1, pp.1–27.

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This paper is a revised and expanded version of a paper entitled 'A guidebook proposal for financial literacy education in mathematics courses' presented at 5th International Symposium on Turkish Computer and Mathematics Education, Alanya, Turkey, 28–30 October 2021.

1 Introduction

Financial literacy involves using knowledge and skills to make suitable financial choices (Lusardi, 2012; OECD, 2016). Financial literacy is a considerable competency for everyone to possess, not only those specifically within the financial area (Bosshardt and Walstad 2018). It can be considered in four main dimensions: financial knowledge, skills, behaviours and affecting factors.

The financial independence of individuals is an important qualification; some developments, such as challenging economic conditions, increasing needs, and sociological and technological changes, have required a more intensive use of this qualification from younger ages (OECD, 2017a). In addition, individuals need to balance their financial behaviours with affecting factors, such as advertisements, social environments, and individual perceptions, and have to have financial knowledge and skills (Oehler and Wendt, 2017). Further, people have their roles restricted more and more every day against the governments and financial institutions in terms of financial regulations (Willis, 2017). It has been seen that, in particular, in the international pandemic of coronavirus, individuals stand alone with their financial responsibilities and decisions. In this respect, it is seen that the financial independence and well-being of individuals rely on financial responsibility. This situation requires individuals to perform more for their financial qualifications. Financial literacy has been frequently discussed regarding its integration into the education system for approximately the last ten years in international summits led by the OECD, such as the Group of Twenty (OECD, 2017a; Willis, 2017).

Mathematical literacy is about being able to use mathematics in real-life situations effectively and meaningfully (NCTM, 2000). Discussing mathematical literacy models by considering the major mathematical processes, such as *reasoning, representing*, *communicating*, *using technology*, and *manipulating* can summarise mathematical literacy as *understanding mathematics*, *doing mathematics*, *and being interested in mathematics* (Pugalee, 1999; Van de Walle et al., 2007). Mathematical literacy provides intense mathematical thinking related to daily experiences (Kilpatrick, 2001). Currently, one of these closely related areas is finance. For this reason, the interaction between mathematical and financial literacies is seen as an important field (Lusardi, 2015).

The OECD (2016) states that mathematical literacy is a prerequisite for financial literacy and declares that the domains of mathematical and financial literacies in the Programme for International Student Assessments (PISA) have a meaningful correlation (0.83) (OECD, 2014). Further, the NCTM takes care into account the relationship between mathematics and financial literacy (NCTM, 2011). Mathematical and financial literacies have common processes, such as *reasoning*, *manipulating*, and *representing* (Geiger et al., 2015; Leung and Bolite-Frant, 2015; Ozkale and Ozdemir Erdogan, 2022). Besides, it is noted that both fields support each other (Sawatzki, 2017; Sole, 2017). In this context, it is voiced that the interaction can take place not only in common process

skills but also in the dimensions of content and context (Jayaraman et al., 2019). In this regard, monetary transactions, budgeting, rental options, interest rates, and estimating prices of products along with paying taxes can be expressed as some of the basic common concepts (Lusardi, 2012; OECD, 2020).

Although there are some negative approaches to this integration that rely on the idea that individuals have a very limited intervention against the financial administrations (Akerlof and Shiller, 2015), many countries, such as Canada, Singapore, and Australia, have attempted to integrate financial literacy into their education systems from early ages in order to increase the number of people who are financial literate (ASIC, 2011; Ministry of Education Ontario, 2010). This integration has two components: one of them is to organise a separate financial literacy course, and the other is to include financial expectations in related courses, such as mathematics. For example, in Ontario (Canada), a wide preparation was made for the integration of financial literacy into related courses, including mathematics. Numerous groups of people, including scientists working in related fields, such as pedagogy and curriculum studies, as well as teachers and school administrators as interlocutors of its integration, worked together. With this effort, documents were written that contained the reflections of the relationships with the curriculum, as well as helpful online and printed supports, and have been presented to teachers and parents. Additionally, the expectations and observations of society have been taken into account. This initiative, which came to life in 2010, has shown positive results. Ontario ranked fifth among 29 regions in the 2015 PISA results, while Canada became one of the top three countries in 2018 (OECD, 2017b, 2020).

As another perspective, studies involving learning process experiences for similar integrations are considerable tools for realising the interaction. The studies focused on the interaction handle approaches on the integration of financial literacy education into classes. In these studies, it is stated that cognitive and emotional acquisitions of students, along with meaningful differences, are measured as well as the teachers also indicating positive approaches toward this integration (Blue et al., 2018; Dituri et al., 2019; Visano and Ek-Udofia, 2017). In the second view, there are studies that make an effort to establish the infrastructure of the integration. Sawatzki (2017) designed tasks similar to PISA questions because the interaction has strong relationships with PISA (OECD, 2014; 2017b). The students declared that the tasks relied on intense real-life relationships. Sawatzki (2017) claims that designing tasks requires relation to students' experiences and interests as well as the establishment of a strong background. In a similar conceptual study, Ozkale and Ozdemir Erdogan (2022) analysed PISA questions of mathematical and financial literacies. According to the study, because PISA handles these domains separately, it did not declare the aim of the interaction, although questions reflect the interaction in all dimensions, content, contexts, and processes (Ozkale and Ozdemir Erdogan, 2022).

Turkey has not yet taken serious steps in its financial literacy education initiatives, despite it being a part of the international organisations. There are studies on neither a separate course on financial literacy nor the integration of it into a related course such as mathematics. However, Turkey requires comprehensive and detailed studies and initiatives for financial literacy education as much as other countries.

We approach financial literacy education positively and support the idea that financial literacy education from early ages can be the right beginning for sustainable and permanent success. The purpose of the study is to respond to the needs within the field of mathematics education in Turkey, without interfering with the curriculum, through a

guidebook for grades one to eight. In the study designed by document generation methods (Kieran et al., 2013), we consider the applicability principle, we explore the idea of addressing financial literacy in mathematics courses without interfering with the curriculum at elementary level. In this regard, we designed 49 hybrid tasks from grade one to grade eight in conjunction with implementation steps, financial expectations, mathematical learning areas, topics, and acquisitions, along with the background of the design of each task. The tasks that are the focal point of the guidebook are presented for the teachers along with knowledge on children's financial understanding. The tasks were designed according to task design parameters as well as the spiral approach which is used for the curriculums of Turkey as well. Tasks organise learning activities and guide teaching and learning processes, and they also include background on the design of the tasks. The target audience of the study is teachers. Supposing that teachers do not have sufficient proficiency in financial literacy, we presented the tasks in a guidebook with instructive knowledge that would support classroom practices such as children's financial understanding, financial literacy, and the interaction between financial literacy and mathematics education. The guidebook has all aspects for tasks and their implementations as well as is familiar for teachers. It is expected that it is a lead for similar financial literacy initiatives because of its comprehensive and applicable construction. At the same time, as a product of the research on the integration of financial literacy into mathematics education in Turkey, it is expected that the guidebook will be presented to teachers by the Ministry of National Education of Turkey (MEB).

2 Financial literacy in Turkey

Non-governmental organisations regarding financial literacy in Turkey cooperate with the government and financial institutions as well as contributing to studies, raising awareness about financial literacy and analysing the current situation. In this regard, a survey shows that the number of individuals at the minimum level of financial knowledge in Turkey is 70%, while it highlights that approximately 35% of the youth have unrealistic expectations about financial issues (Finansal Okuryazarlık ve Erişim Derneği, 2017).

From an international perspective, in a study on adults' financial literacy scores across 144 countries, Turkey was ranked at 120 with a rate of 24% (Klapper et al., 2015). Another survey among the G20 countries revealed that the overall financial knowledge, attitudes, and behaviour scores of Turkish people were below the G20 average (OECD, 2017a). Also, another international study measured Turkey as one of the six worst-performing countries among 31 different countries (Bhutoria et al., 2018). Unfortunately, this unfavourable status reflects on university students as well (Gok and Ozkale, 2019). Another problem is the lack of studies regarding the measuring of financial literacy of children.

While financial literacy initiatives in Turkey include short-term finance literacy seminars, financial literacy certificates held for adults, and community awareness conferences, the Ministry of National Education (MEB) dealt with an attempt to integrate financial literacy into the curriculums of less relevant areas, such as art, but it has not been observed that this initiative has had positive reflections (MEB, 2016). Although Turkey participates in the PISA exams as a founding member of the OECD, it has not yet been included in the domain of financial literacy.

Unfortunately, in Turkey, there is no financial literacy education as either a separate course or a part of a related course. Nevertheless, probable relations in the curriculums have been handled in a few studies. Güvenç (2017) examined the curriculums of all courses and noticed limited relations. In a study restricted to mathematics curriculums, Ozkale and Ozdemir Erdogan (2017) expressed that mathematics curriculums have decreased their relationships with financial expectations as a consequence of changes to curriculums.

The mathematics curriculum was revised last in 2018, with elementary level divided into two parts. The first part is from grade one to grade four, constituting primary school. The second part is from grade five to grade eight, constituting secondary school, along with *the practice course*, which is separated from the main mathematics course. The curriculum particularly declares that teachers have a high responsibility for performing education. It expresses that teachers should present the topics and concepts according to the level of the students. Also, it emphasises that teachers should be careful about values in all educational situations.

The curriculum focuses on a number of relationships. Acquisitions should be related to *pre-learning* as well as tasks and examples should be related to *real-life*. Further, mathematics should be related to other disciplines. For this reason, in the curriculum, some financial concepts, such as tax, savings, or recycling, are mentioned as well. Although relationships with real-life and pre-learning are varied, the relationships with other disciplines are scarce. In the mathematics curriculum, special mathematical purposes are declared [MEB, (2018), p.9]. One of these purposes is about mathematical literacy as well. In the curriculum, *reasoning*, *problem-solving*, *estimating*, and *communicating*, which are the general skills of mathematics education as well as the common processes of mathematical and financial literacies, are expressed as critical processes (MEB, 2018; Ozkale and Ozdemir Erdogan, 2022).

In the mathematics curriculum, a direct relationship with financial literacy exists only in the learning area of data management [MEB, (2018), p.50]. After changing the mathematics curriculums in 2005, there were many indirect relationships with financial literacy at the elementary and secondary levels. However, after both the 2013 and 2017 changes, this was decreasing, even though the concept of financial literacy was added to the curriculum in 2017 (Ozkale and Ozdemir Erdogan, 2017). The most related topic with financial literacy is *'our currencies'*. The introduction of banknotes and coins, simple monetary transactions, and the processes of shopping and saving are the topics of *our currencies* [MEB, (2018), p.50]. Yet, the relationships with financial literacy in the curriculum are scarce and indirect; therefore, it has been stated that the mathematics curriculum needs to be enriched by tasks and other educational tools for financial literacy (Ozkale and Ozdemir Erdogan, 2017).

3 Background

3.1 Financial understanding at early ages

Children have a financial perspective of narrowness and misunderstanding that develops over time in their minds. The process, starting with getting acquainted with money, proceeds with new financial concepts such as payment, shopping, earning, and jobs. Through progress based on their experiences and learning, children not only realise new

upper concepts such as saving, pricing, interest, and banks and other financial institutions, but they also fix their misconceptions (Piaget, 2003). This progress is classified in a number of *stages* in studies regarding financial understanding at early ages (Berti and Bombi, 1988; Webley, 2005). For example, in stage 0 (3–6 years old), children initially think that their parents decide the price of the products, while in time when they recognise related concepts such as cashiers (in stage 1), merchants, or producers (in stage 2), they realise that these factors may also affect prices (Siegler and Thompson, 1998). The concepts they learn up to stage 3 may be formed incorrectly because, during the processes up to the age of 12, children may not be able to analyse the relationships between these concepts (Piaget, 2003). In stage 4, an idea occurs regarding the balance between these factors, and stage 5 involves a discussion about the reasons and ethics of price manipulation.

The ages of up to 6–7 years old are early for comparisons such as cheap vs. expensive. At those ages, they cannot realise details about their features and functions, although they make acquainted with financial facts in the ages up to ten. For instance, they recognise banks as institutions related to money, but the relationships between sub-concepts such as investment and loans cannot be interpreted. At 11–14 years old, financial concepts start to be handled in detail. Processes such as price–quality comparisons can be discussed, and the reasons behind related concepts such as work and unemployment can be questioned. However, they may also express false thoughts due to a lack of experience and knowledge (Piaget, 2003). In this regard, it is advised that financial concepts in children's worlds should be handled by paying attention to the financial understanding stages (Aprea et al., 2016; Blue et al., 2018; Duveen, 2013).

3.2 Task design parameters

Task design parameters are taken care into account as a structural basis for the design. A task is a learning activity based on directions for cognitive development through practice (Doyle, 1992). Tasks are not only learning environments formed for acquisitions and their measurements but also teaching activities that are part of planned progress. Parameters are the criteria regulating both the design of the task and the implementation phase (Watson, 2016). Tasks comprise complicated relations among teacher, learners, teaching, and learning strategies, along with the environment and knowledge (Kieran et al., 2015).

Tasks can be diversified according to the level of experience of the target population (*novice* or *expert*), aims of the task (*classifying*, *defining*, and *interpreting*), and questions included in the tasks (*closed*, *open-middle*, and *open-ended questions*) (Burkhardt and Swan, 2013; Swan and Burkhardt, 2012). Tasks designed professionally include transparent demands to be able to evaluate students' achievements (Swan and Burkhardt, 2012). Also, tasks are built according to *accessible challenges* supported with other parameters, such as *unfamiliarity* and *technical demand* for each student level to keep their attention. Tasks can excite students through *unique contexts* (Burkhardt and Swan, 2013).

Teachers are responsible for streamlining the task in class (Kullberg et al., 2013). They should provide *flexibility* for students in the implementation steps, although tasks are designed through a purpose and conceptual framework. Similarly, the *social issues* and *values* in the tasks should be streamlined according to society (Bartolini Bussi et al., 2013; Maheshwari and Vohra, 2018).

The surface of tasks contains mathematical aims, learning areas, and acquisitions. Tasks take into account the conceptual basis and development, misconceptions, difficulties, and pre-learnings. Also, diversifying the tasks according to the targets, strategies, tools, and technology is one of the considered parameters of the design. In this regard, prominent task design parameters are listed in Table 1. For this, in particular, studies on mathematical tasks are included.

Table 1 The prominent parameters of task design

Purpose	*Roles*	*Conceptual ground*
Theoretical approaches	Flexibility	Specific topics, authentic and pure contexts
Measurement and evaluation	Cultural adaptation	The curriculum
Transparent demands	Social issues	Misconceptions and difficulties
Accessible challenge and unfamiliarity		Pre-learnings
		Teaching and learning strategies
		Learning environments, tools, time
		Processes
		Face validity

Source: Burkhardt and Swan (2013) and Watson and Thompson (2015)

3.3 The spiral approach in the mathematics curriculum

The spiral approach is a tool to organise the curriculums or any educational material (Bruner, 1960; Harden, 1999). It is beyond a repetition. It includes not only a meaningful design but also relationships between knowledge, real-life, pre-learning, and other disciplines (Fried and Amit, 2005).

The spiral approach includes the following aspects of design curriculums and learning environments:

- revisiting the critical topics, acquisitions, and values
- increasing the level of difficulty along with the progression from simple to complex
- progressing horizontally and vertically
- increasing knowledge, skills, experience, and proficiency by covering pre-learning
- relating to real life as well as pre-learning
- logical sequences
- flexibility (Bruner, 1960; Fried and Amit, 2005; Harden, 1999).

The spiral approach is a useful and in-demand tool for designing curriculums in many countries (Fried and Amit, 2005). The mathematics curriculum of the MEB is organised using the spiral approach as well. The mathematics curriculum reflects the spiral approach in three ways (Fried and Amit, 2005; Wang and McDougall, 2019). The first is the *progressive way*: the acquisitions designed with the spiral approach progress from easier to harder. Second is the *supporter way*: the acquisitions are designed around the

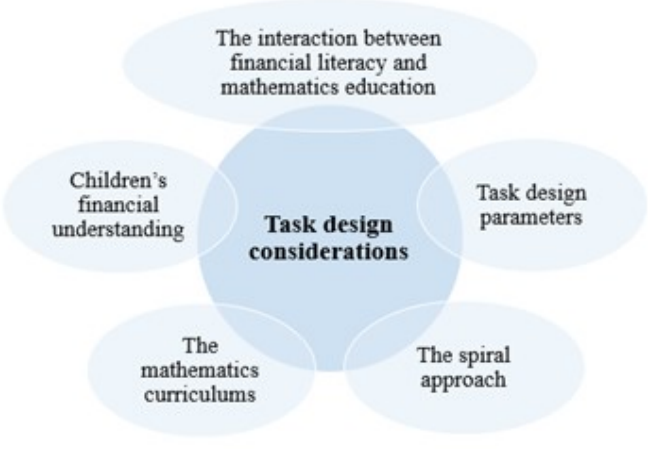
pre-learning. The third is the *reminder way*: the concepts are reconsidered with a new acquisition.

4 Designing the guidebook

This study focuses on the organisation of the guidebook rather than the tasks that are the core of it. In Section 4, it is tried to indicate the framework of the guidebook for mathematics education in Turkey as well as its preparations for it. So, subheadings in Section 4 are on the curriculum and the distributing the tasks. However, all considerations for not only the tasks design but also the guidebook are touched on briefly. This section has been organised to explain how the tasks are selected, distributed according to levels, contents, and numbers of them.

The guidebook and the tasks included in it have a wide-range surface (Ozkale and Aprea, 2023). In this regard, there are some explanations on the main dynamics of the design of the tasks and the guidebook (Figure 1).

Figure 1 General dynamics of the tasks and guidebook (see online version for colours)



The first aspect of the study is the *children's financial understanding*. The major studies published since the 1950s regarding the financial understanding of children were examined (Berti and Bombi, 1988; Brown et al., 2016; Duveen, 2013; Webley, 2005). This included not only financial concepts for children but also stages and age ranges for the development of the concepts (Piaget, 2003). The second aspect is *the interaction between financial literacy and mathematics education*. This interaction includes both PISA documents and integration initiatives regarding mathematics courses (ASIC, 2011; Ministry of Education Ontario, 2010). Also, studies regarding the interaction were considered to clarify the following: conceptual relations, common process skills, and methods of teaching experiments (Blue et al., 2018; Dituri et al., 2019; Geiger et al., 2015; Sawatzki, 2017; Sole, 2017).

4.1 The curriculum as a ground

The tasks were designed according to the *universal mathematics education standards*. The targets were the elementary mathematics education in Turkey and the elementary mathematics curriculum of MEB (MEB, 2018; NCTM, 2000; Van de Walle et al., 2007). Observing the introduction of the curriculum, it appears to express similar expectations and aims. Second, some major considerations, such as the relationships with real life and pre-learning, student and teacher roles, learning and teaching strategies, and values, were examined for the harmony with the task design principles. Then the main structure of the curriculum was analysed by examining other details, such as learning areas by grades. Third, the way in which the curriculum reflects the spiral approach was examined. The traces of the spiral approach indicating the horizontal and vertical relationships between grades, units, and topics were determined. Forth, the curriculum was handled as a ground for financial literacy expectations. PISA documents and similar initiatives, as well as the literature on the children's financial understandings, were used to determine the target learning areas and topics. It was planned for the guidebook to softly integrate financial literacy into mathematical education. Therefore, each task should be able to be seen as a mathematical task. In this regard, each task was designed by considering the acquisitions and learning areas of the curriculum.

The elementary mathematics curriculum is comprehensive because it includes grade one to grade eight, and there is a practice course in mathematics for grades five to eight. For this reason, the curriculum was restricted to a portfolio including target learning areas. The first items of this cluster were topics that had relationships with the financial circle and financial concepts. In the designing task, the curriculum was handled as a whole, but the reduction was seen as necessary in terms of the number of tasks, course hours, learning areas, and acquisitions.

4.2 The spiral approach for distributing the tasks within the curriculum

The number of tasks was determined according to the fundamental features of the curriculum, such as grades, course hours, number of acquisitions, and number of units and topics, as well as the features of the project, such as the working plan, processes of the design, and opinions of experts. As a result of the considerations, the number of tasks was determined as 49 (Ozkale and Aprea, 2023). Tables 2 to 4 indicate the distribution of the tasks in the learning areas and grades.

Table 2 The target learning areas of the tasks for elementary level grades 1–4

Learning area	*Grade 1*	*Grade 2*	*Grade 3*	*Grade 4*
Our currencies	2	2	2	
Data management	1	1	1	2
Numbers operations			2	1
Fractions			1	1
Measuring			1	2
Total (19)	3	3	7	6

Table 3 The target learning areas of the tasks for secondary level grades 5–8

Learning area	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*
Operation with numbers	1	1		
Decimals	1	1		
Percentage	1		1	
Algebra		1	1	2
Data management	1		1	1
Rate and proportion			1	
Probability				1
Total (15)	4	3	4	4

Table 4 The target learning areas of the tasks for secondary level grades 5–8 of the practice course

Learning area	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*
Factors, multiples and exponentials				2
Operation with fractions	1			
Clusters		1		
Rate, proportion and percentage			2	
Decimals and rational numbers	1			
Algebra			1	1
Measuring	1	1		
Data management and analysis		1	1	1
Probability				1
Total (15)	3	3	4	5

The following criteria were considered for the distribution of the tasks:

1 the relationships in each level

2 the frequency of the related topics

3 the similarities and differences of the learning areas to each other

4 different approaches of the main and practice courses

5 the number of tasks in the same level

6 reasonable distribution among the levels

7 the diversity of learning areas, topics, and acquisitions.

4.3 Formation of tasks

Aside from including content and being structurally equipped, care is taken to ensure each task is formally readable and easy to use. For this reason, the sections of each task were prepared in a format that shows their relations. The guidebook, which had been used in Turkey until 2013, provide a sample of this format. The format of the tasks consists of three pages. The first page, for students, contains explanations and images related to the

task along with instructions and tools to be used. The second page, for teachers, presents relations to pre-learning, real life, and other disciplines, alongside the implementation steps, as well as the grade, learning area, mathematical acquisitions, time, limitations, and values. The last page discusses the background for designing the task based on the related resources and indicates the financial basis, common processes, and content. Appendixes 1–3 are indicated so that these details can be seen.

Since the guidebook aims to support financial literacy integration, it is not the kind of guidebook that was used in mathematics courses in Turkey until 2013. Tasks are at the centre of the guidebook, and related knowledge such as financial literacy, mathematical literacy, and the interaction between them, along with references, are presented for teachers (Figure 2).

Figure 2 An example for the background of a task

How to be organized the task 21: What is the worth of my tax?

Taxation is an essential concept of Financial literacy because that is not only a mathematical operation but also a dynamic of social policies. The Maths Curriculum of Turkey notes [1] the concept of tax like Ontario [2]. Taxation includes some mathematical contents such as percentage, decimals, proportions and converts. So the task should have been presented in a grade that the common point of these contents, like in grade 7. Also, The task considers tax as a sociological situation rather than individual expectations. So, the task leads to readers to pay tax and to follow ways that use taxes. In this task, students are wanted to reflect mathematical skills to a financial understanding of taxation. In the task, there are some mathematical operations, so these operations cause to trigger the numeric meaning of tax. Also, there is the financial meaning and importance of tax in the task. So, readers can develop a comprehensive meaning on tax and taxation [3].

[1] MEB. (2018). Ortaöğretim matematik dersi öğretim programı. Ankara: Devlet Kitapları Müdürlüğü Basım Evi. (p. 15)

[2] Ontario. (2011). *Financial Literacy Scope and Sequence of Expectations. Resource Guide. The Ontario Curriculum Grades 4-8.* Toronto: Ministry of Education Ontario (p. 31)

[3] OECD. (2016). *PISA 2015 Assessment and Analytical Framework: Science, Reading, Mathematic and Financial Literacy,* PISA. Paris: OECD Publishing (p. 89)

Teachers are the leaders in classes, but it has been suspected that they do not have enough knowledge about financial literacy. The design of the background was intended to develop teachers' ideas before the implementation phase and make the tasks more effective. In the discussion, examples of the design of the tasks in light of the background were discussed with the considerations. The conclusion is the evaluation of the guidebook before implementation.

5 Exploring the design of the guidebook for the integration

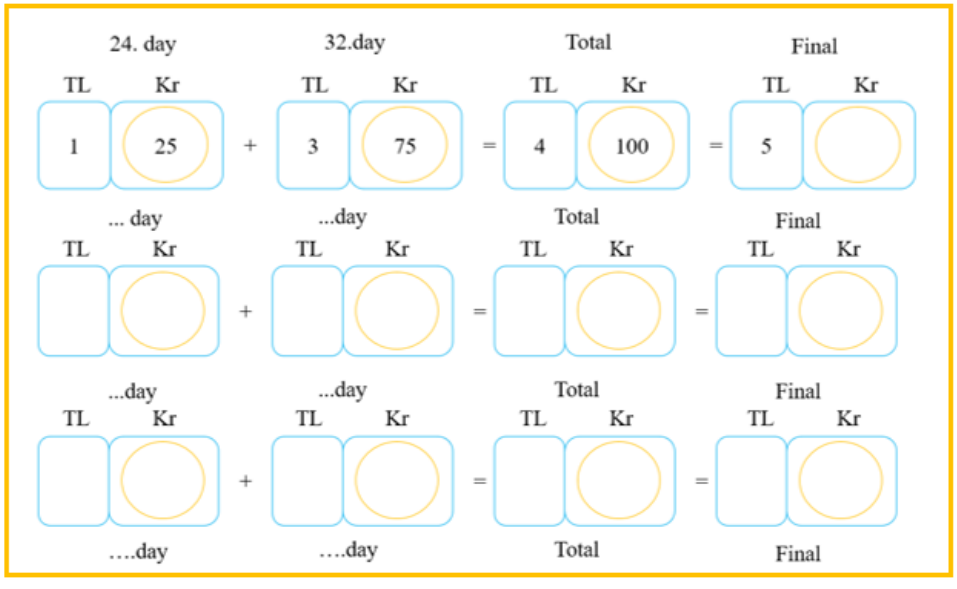
5.1 Exploring the harmony between the curriculum and background of the integration

It is not easy to attempt an integration without interfering with a curriculum that involves intricate relationships. For this, it is necessary to ensure harmony between the curriculums and the background. This harmony is ensured through carefully designing each task, considering the targets of the curriculum, the learning areas where the tasks were taken place, and the acquisitions, along with the course hours.

The tasks in the guidebook focus on financial concepts that took place in children's worlds and contributes toward them in the near future. For example, pocket money and kinds of money are the financial concepts mentioned in the curriculum, and these tasks are developed in accordance with their acquisitions [MEB, (2018), p.51]. In addition, some contexts are designed for related concepts, such as *unit price*, *wholesale*, or *instalment. Credit*, *invoice*, *salary*, and *working hours* are included in the tasks as concepts that they had heard about and would develop over time.

Attention is given to the design in order to evolve the acquisitions that face financial literacy. In this regard, the learning area of *our currencies* has an important status at the elementary level. A total of six tasks, two for each level from grade one to grade three, are designed for the learning area of *our currencies*. In these tasks, the current acquisitions are placed with financial expectations that could be integrated together. For instance, in a task for grade three, the relationship between Turkish Lira (TL) and Kurus (Kr) (like the Euro and the US dollar) are addressed. This relationship is directly addressed in the curriculum [MEB, (2018), p.42]. In this task, the conversion of Kr to TL through binary additions of pocket money given to a child is discussed (see Figure 3).

Figure 3 The relations between TL and Kr in a task (see online version for colours)



Numbers may mislead students about the value of money in early financial perceptions. Sato (2011) thinks that such examination may be useful for seeing the value of money and numbers. Similar examples are included in the Ontario mathematics curriculum along with decimal representations [Ministry of Education Ontario, (2011), p.15]. However, there are warnings to avoid such representations in the elementary curriculum of the MEB (2018, p.35). Therefore, such representations are not added to the list of tasks.

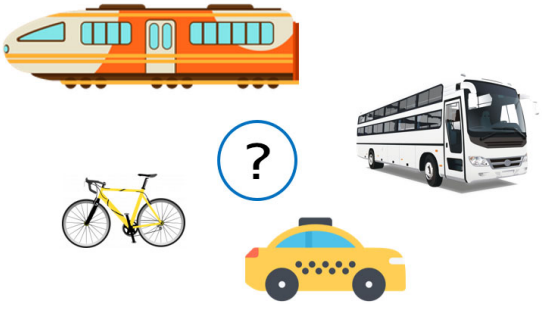
PISA presents questions such as *sailing ships* and *new offer* so that students to know and deal with such concepts with *accessible challenges* [OECD, (2013), p.12, (2017b), p.62]. With much consideration, tasks in higher grades that are close to the PISA age-level, including topics such as *finding a job*, *minimum wages*, and *loans*, are shaped

around the mathematical acquisitions. In designing the basic dimensions of PISA, *contents*, *contexts*, *and processes* are taken into consideration (OECD, 2014). Also, financial contents are supported by the financial understandings of children as well as the common processes that are used. Thus, common processes that could be reflected in the current acquisitions in the learning area are determined, and tasks are shaped accordingly. In a task built on the comparison of vehicles according to their features, it uses processes such as *procedural understandings*, *manipulating*, and *estimating*, which support proper choice, as well as *communicating* and *representing* processes, which effectively indicate financial and mathematical thoughts (OECD, 2017b; Ozkale and Ozdemir Erdogan, 2022) (see Figure 4).

Figure 4 The task on optimum choice for proper vehicle (see online version for colours)

Task 33: Which vehicle?

Erdem who is a university student in Ankara should decide how he goes to the school. He has a budget for transportation by 100 TL and in the city, there are three options along with his bicycle as a free vehicle for this transportation. The prices of the vehicles for the trip are indicated below. He must use one of them to go to the school 20 days in each month twice (round-trip) every day.



Vehicle	Price
Railway *(per ticket)*	2.50 TL
Taxi *(for the distance)*	12 TL
Bus *(per ticket)*	2.25 TL
Bicycle	Free

Accordingly,

a) According to the condition determined in the explanation, how many options does he have?

b) Set a table indicating all the total fees for the vehicles for a month regarding the expressions.

c) Within the conditions, what is the probability of the taxi option?

d) In this condition, which options have the same probability?

e) Which vehicle would you prefer regardless of his condition? Could you explain your reasons briefly?

f) Do you use public vehicles services? Do you think these prices are actual? Do you have any idea about the prices of public vehicles services?

We advise not to use a calculator in order to see the relations between the numbers. It makes you realize the relations. You can check your idea on the internet about the prices of the public vehicle services after the task.

One of the most prominent common points between the curriculum and financial literacy is the importance given to relationships with real life. The curriculum implies that these relationships should be supported by pre-learning and also spread to other disciplines [MEB, (2018), p.14]. In this regard, each task is based on a real-life situation, and the pre-learnings determined in the analysis of the curriculum are integrated into the tasks. For example, in a task for grade four based on painting a small village school, some pre-learnings are specified, such as geometric objects, shapes, and measuring length, and it

emphasises implementation steps handling them with related topics, such as *cooperating*, *work-sharing*, and *doing it yourself.*

Although the relationships to other disciplines are mentioned at the beginning of the curriculum, it is seen that they are not reflected intensely to the acquisitions (MEB, 2018). The design adds a new aspect to the integration by handling a social issue in each task. Social contexts such as *giving a gift to a friend*, *saving natural resources*, *equality*, *and working conditions* are handled in accordance with the level of the students. This effort aims to show that the prices and numbers are not a single quality for financial choice and that they can be handled with cultural, social, and universal values. It has been stated that decisions focusing only on the numbers exclude individuals from being a part of society (Oehler and Wendt, 2017; Willis, 2017). Accordingly, there is an effort to encourage individuals to take into account social concepts such as *waste*, *social justice*, and *sharing* in financial activities such as earning and spending.

5.2 Distribution using the spiral approach

The spiral approach for distributing the tasks is established depending on the path taken in the curriculum. In the curriculum, a logical plan is made, in which students reconsider the topics at intervals, from the known to the unknown, using horizontal and vertical progression through learning areas, acquisitions, and pre-learnings (Caliskan-Dedeoglu and Alat, 2012; MEB, 2018). The tasks are built on the mesh. This enables not only the progressive re-handling of the same subject with new acquisitions throughout the grades but also pre-learning that supports the related acquisitions in various topics and units (Fried and Amit, 2005; MEB, 2018). For example, in the learning area of *data management*, the 11 related tasks are included in each grade. The concepts and acquisitions of a task in a grade are also pre-learning for other related topics. As an example of the reflection, the tasks that are related to the learning area of *data management* contribute directly to seven tasks in the learning areas of *numbers and operations*, *algebra*, and *probability*. As another learning area, *fractions* is mentioned in 33% of tasks. Table 5 shows the horizontal relationships between *fractions* and other learning areas.

Table 5 The related learning areas to fractions

Grade	*Learning area*	*The number of related tasks*
4, 5, 6	Measuring	3
6, 7, 8	Algebra	5
5, 8	Data management	2
8	Exponentials	2
8	Probability	1
	Total	13

The tasks are grouped according to common contexts and acquisitions in both vertical and horizontal progressions. For example, six tasks in the learning area of *our currencies* are designed by two groups in the first three grades. One of two groups is designed within the context of giving a gift. The acquisitions of the first task are related to evaluating the prices and products. The acquisitions in the first task are used for the other tasks in the same task group as a pre-learning. The learning area of *data management* has four task

groups and a total of 11 tasks, with one of the groups established using money, involving changing money in a cash register in a mall. It handles the relationships between TL and Kr.

Figure 5 Consecutive tasks at grade 4 for the learning area of data management (see online version for colours)

Task 10: Mr/Ms Cashier

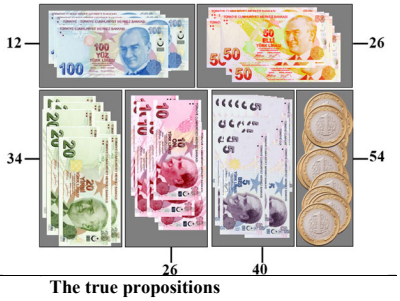
The image below indicates inside of a cash register including some money with their numbers.

a) Draw a bar chart indicating the money and their numbers.

b) Write correctly the false propositions below on the right side.

c) If you are the cashier, how would you get back the change to the costumers who do these shopping in the table below?

d) What is the banknote or coin that you use the most when you change money in the question c? How do you explain that?



The false propositions	**The true propositions**
• The most valuable section on the cash register is the section of 1 TL.	

Shopping 1: 87 TL	***Given: 100 TL***	***Change: 13 TL***
		
Shopping 2: 23 TL	***Given: 25 TL***	***Change: … TL***
		

Task 11: Healthy eating

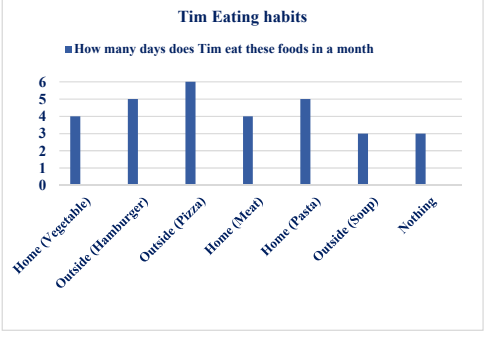
The bar graph below indicates Tim's eating habits. Tim who is a college student living alone eat sometimes at home sometimes outside, even he doesn't eat anything some days.

According to the bar graph,

a) Which foods does Tim eat in the equal number of the days?

b) Does Tim eat at home more or outside?

c) There are statements about the results of eating habits of Tim. Please read them, and if you agree with it or not, write something about it briefly.



The statements	**Your opinion**	
• Tim spends fast foods much. It must be delicious.	I agree with it ( )	I don't agree with it ( )
• Such foods make weight. If he keeps to eat them, he put on weight. For this reason, he might spend his	I agree with it ( )	I don't agree with it ( )

Another spiral process is the handling of the same financial situation under different mathematical learning areas (Harden, 1999). In this method, the aim is to examine various aspects of the subject with different mathematical arguments. For example, spending is presented through the concepts of unit price, fractions and percentage with the contexts of online shopping, tax and optimum choice.

5.3 Exploring the traces of task design parameters

Task design parameters are examined in two groups:

1 preparations for teaching

2 implementation steps along with arrangements (Swan, 2007).

The main matter of the first group is the classification of tasks according to their purposes (Watson and Thompson, 2015). The guidebook takes care to distribute a balance of *novice* and *expert tasks* for various student levels at all grades (Burkhardt and Swan, 2013). The task groups are laid out for both types. Novice tasks are predominant in tasks prepared for smaller ages of task groups, while the second/third task of the same task group is designed as an expert task based on pre-learning experiences. Novice and expert tasks are presented together in 12 of 17 task groups (71%). There are also task groups reflecting horizontal progress prepared for the same grades. For example, in a task group prepared for the learning area of *data management* in grade four, there are two tasks handling values of money and including question types with *open questions*, *statements*, and *drawing charts* (see Figure 5) (Burkhardt and Swan, 2013).

These questions asked students to provide coherent answers and think about the types of money that are used frequently. In a task in which a large number of money-related equations are manipulated, the frequently used types of money and the questioning of their reasons are handled with *procedural understanding* and *evaluating* processes (Geiger et al., 2015). On the other hand, there are also task groups whose tasks are either all expert or all novice. This is based on the strength of the relationships of the acquisitions with other subjects and the intensity of the pre-learnings. The bias that almost all of the tasks of the first four grades (grades one to four) are novice would be wrong. Seven tasks (37%) are designed to be expert for a total of 19 tasks for these grades. Since the tasks are generally built on mathematical concepts and financial contexts discussed in previous grades, they involve more *reasoning* and *communicating* processes.

As the second aspect of design, *teacher roles* and *implementation steps* come to the forefront in the parameters regarding the implementation phase (Watson and Thompson, 2015). Although the tasks are designed to be student-centred, teachers conduct them in the classroom. In this regard, teachers have to adjust tasks according to the classroom environment and student levels (Kullberg et al., 2013). The task design provides details on the implementation steps to reduce the effort required by the teachers. These steps direct the progress, and at the same time, they also guide possible learning processes. In this respect, it can be said that the guidebook requires teachers to prepare for the flexibility structure of the tasks before their implementation. The guidebook emphasises that teachers should adapt the tasks according to the local values and trends of students in the class (Brousseau et al., 2014). Explanations and suggestions are expressed in the background section of the tasks (Sawatzki, 2017). For example, in an examination on the

profit-loss situation of a coffee machine in a school canteen, the focal point is on the amount of use of the paper cups, milk, and coffee. In this task, it is stated that this context could be handled using the variables of tea and sugar. Additionally, some social issues may be closer to real-life in some regions. Teachers encourage students to internalise a matter by handling it in detail. For example, the concepts of *work*, *child labour*, and *equal earning* may be more attractive to children in regions that have close relations with these problems. Teachers should bring together the students' interests with financial expectations in order to make optimal arrangements.

6 Conclusions

The financial literacy scores of Turkey show that its situation is poor on an international scale. At the same time, the MEB, as the relevant authorised institution in Turkey, has not taken serious steps for financial literacy education yet. The guidebook focusing on mathematics classes in grades one to eight has strong relations with financial literacy and offers support handled with all dimensions for the integration to the MEB. This support for the integration is advisory and does not interfere with the curriculum because that is one of the main bureaucratic difficulties. This suppleness improves its applicability. Teachers can use each task in the guide as a mathematical activity. This could be an advantage that makes the guidebook more likely to be accepted in schools. Besides, teachers in Turkey are familiar with this kind of guidebook. Designed similarly to the guidebook applied until 2013, it offers strong support to the teachers, with not only the background but also the suggestions and instructions on implementation steps. Considering the connection between financial literacy and real life, it is thought that the guidebook would be an interesting study for teachers, students, and even parents.

The curriculum reflects the standards of contemporary mathematics education and also uses the spiral approach. However, the quality of the curriculum should be measured through the success of teaching activities in the classroom. In this regard, the quality of the design of the guidebook can be seen in classroom applications. The next step is the implementation phase of this research. For this, experimental studies are thought for elementary schools in Turkey. Moreover, it is expected that the studies would trigger similar initiatives for Turkey like other countries.

Turkey is not a participant in the financial literacy domain of PISA due to its backwardness in financial literacy education. After integration, the performance of students in related exams similar to PISA will show noteworthy improvements for Turkey. As a result, it is recommended that, in Turkey, studies on financial literacy increase for mathematics education along with discussions on financial literacy focusing on PISA.

Acknowledgements

This work is supported by the Scientific and Technological Research Council of Turkey [TUBITAK] under Grant 1059B191802080.

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Appendix 1 (see online version for colours)

Page 1

Task 21: What is the worth of my tax?

The administration of each country services to their nation by the income of taxes which are gathered from people.

In each product, there is an amount of tax by variable rates.

According to law, the amount of tax for a gum, which costs about 0.50 Kr, is 8%.

a) Find the amount of tax of a gum.
b) If a store sold 500 gums, find the total tax for them.
c) If everyone in Turkey, which are by 82 million, buy a gum, what is the amount of the total tax of the gums?
d) There are below some investments for people such as a school, scholarships or a library. Is the value in C sufficient for cost of them?

An elementary School 3,000,000 TL

Scholarships for 100 students 600,000 TL

Library 3,500,000 TL

You can use a calculator, of course, Also you can go on to search what our nation can have by this amount of tax on the internet.

Page 2

Task 21: What is the worth of my tax? Time: 20 mins	
Grade 7	*The teachers' column*
Learning area: M.7.1. Numbers and operations **Sub-learning area:** M.7.1.5. Percentages **Acquisitions:** M.7.1.5.1. Determine the amounts of a specific percentage of a whole. **Mathematical expectations:** Understand mathematical concepts and use them in real-life. **Relationships to** • *Real life: Tax and its worth* • *Other disciplines: Social sciences and Citizenship* **Financial circle:** The concept of tax **Financial literacy expectations:** Develop the concept of tax, recognize the worth of their tax	**Implementation steps** • Expand the information about tax in explanations a little bit such as different tax rates, some tax types, where taxes are used, briefly. • Be guide to use large values • Encourage students to discuss comparing the values • Finally, Focus on the loss of tax evasion **Relationships to Pre-learnings** • Multiplication and division with whole numbers. • Decimals • The relation between TL-Kr and converting each other • Proportional reasoning **Cautions and limitations** • *Cognitive: Underline proportional comparisons* • *Ethics: Emphasize that tax evasion is an ethical mistake and illegal International and local values: You can mention the amount of gathering of tax in Turkey with basic figures*

Page 3

The general framework of the task 21: What is the worth of my tax?	
A-Financial Circle • *Financial context: the context of tax on the ground of Spending and Financial management and planning* • *Financial concepts: Tax* • *Affecting factors: the experience on the reasoning of tax develops students' opinions and behaviors of paying tax* **B- Content** • *Financial content: Tax* • *Quantity: Percentage, decimals, multiplication*	**C- Processes** • *Identifying financial situation: to realize the concept of tax* • *Reasoning: paying, gathering and using of tax* • *Manipulating and estimating: Calculating and ordering values, estimating multiplication of values* • *Representing: using right units of currencies such TL and Kr.* • *Using technology: Calculator and web-searching* • *Communicating: Discussing the results in class*

How to be organized the task 21: What is the worth of my tax?
Taxation is an essential concept of Financial literacy because that is not only a mathematical operation but also a dynamic of social policies. The Maths Curriculum of Turkey notes [1] the concept of tax like Ontario [2]. Taxation includes some mathematical contents such as percentage, decimals, proportions and converts. So the task should have been presented in a grade that the common point of these contents, like in grade 7. Also, The task considers tax as a sociological situation rather than individual expectations. So, the task leads to readers to pay tax and to follow ways that use taxes. In this task, students are wanted to reflect mathematical skills to a financial understanding of taxation. In the task, there are some mathematical operations, so these operations cause to trigger the numeric meaning of tax. Also, there is the financial meaning and importance of tax in the task. So, readers can develop a comprehensive meaning on tax and taxation [3].
[1] MEB. (2018). Ortaöğretim matematik dersi öğretim programı. Ankara: Devlet Kitapları Müdürlüğü Basım Evi. (p.15) [2] Ontario. (2011). *Financial Literacy Scope and Sequence of Expectations. Resourse Guide. The Ontario Curriculum Grades 4-8.* Toronto: Ministry of Education Ontario (p.31) [3] OECD. (2016), *PISA 2015 Assessment and Analytical Framework: Science, Reading, Mathematic and Financial Literacy*, PISA, OECD Publishing, Paris. (p. 89)

Appendix 2 (see online version for colours)

Task 12: The best option for water bottle

The Family Kurtulus buy one carboy water for 19 liters per week. Filiz wants to figure out why her family don't prefer the other bottles that she sees at the mall by comparing their prices.

a) If you want to fill the bottle of 19 l with the bottle of a half-liter, how many the bottle of a half-liter would you use?

b) If you buy a liter water, with the bottle of a half-liter or the bottle of 1 l, which bottle is the more advantage in terms of its price? Explain how you find out.

c) If you buy 19 l water per week, what would you pay for each these bottles? Explain how you find out.

d) Why do you think about that people need different bottles for water?

19 l

12 TL 35 Kr

1 l

80 Kr

A half-liter

50 Kr

You can draw your own tables to calculate the prices of different values such as 1 l, 5 l, 10 l, and then 19 l.

Task 12: The best option for water bottle Time: 20 mins

Grade 3

The teachers' column

Learning area: M.3.3. Measuring

Sub-learning area: M.3.3.7. Measuring liquid

Acquisitions:

M.3.3.7.1. explain the need for standard units for measuring liquids and do measurements using 1 liter and a half-liter.

M.3.3.7.2. estimate the amount of a liquid using comparing and check the estimation measuring via liter.

M.3.3.7.3. solve problems about liter.

Mathematical expectations: Understand mathematical concepts and use them in real-life.

Use estimation effectively

Relationships to

- *Real life: Proper shopping*
- *Other disciplines:-*

Financial circle: Optimum choice

Financial literacy expectations:

-Using the skill of comparing properly

-Learning the prices of the same products in the different packages

Implementation steps

- First, talk about the sort of bottles of water
- Emphasize double halves are a whole for both liter and Kr
- Check students to use right representations
- Encourage students to reach the same liter water for each bottle without mention greatest common divider (GCD), lowest common multiple (LCM)
- Encourage students to talk about their thoughts

Relationships to Pre-learnings

- Operations with natural numbers
- Measuring with the standard units
- The relation between TL-Kr

Cautions and limitations

- *Cognitive: -Don't mention about decimal representations like 3.25.*
  -Don't use division with decimals.
- *Ethics: -*
- *International and local values: -You can mention shortly to save water resources.*

Behind screen (Background) of the task

The general framework of the task 12: **The best option for water bottle**

A-Financial Circle

- *Financial context: Spending, and Financial management and planning (choosing the most economic bottle)*
- *Financial concepts: The best option*
- *Affecting factors: Each member of a family affects the other.*

B- Content

- *Financial content: Unit price, fees for the same size*
- *Quantity: multiplication with natural numbers but decimals*
- *Space and shapes: measuring liquid*

C- Processes

- *Identifying financial situation: to figure out that if a product is smaller, it has a bigger unit price*
- *Reasoning: -Comparing the price of bottles in terms of their size*

-Thinking through proportional reasoning by using multiplications

- *Manipulating and estimating: -Using logic that double halves are a whole for measuring liter*

-Estimating that reasons for diversification of bottles

- *Reflecting and transferring: using the relationship between half and whole for both price (TL-Kr) and measuring liquid*
- *Representing: Using units correctly and separately for both money and liter like 1 TL 25 Kr or 12 and a half liter*
- *Communicating: -Discussing in class which bottle they prefer with reasons.*

How to be organized the task 12: **The best option for water bottle**

Buying water is a common behavior for everyone and it is familiar for children. The diversification of bottles might be interesting for children, they are curious why they buy water within these bottles. Maybe the bottle that they buy is just a habit though it is not proper. In shopping, the size of products is as important as their price. It depends on their unit prices along with the frequency of using the products. So it is related to both using and waste them. Also, the product that we talk about is water, is a vital substance.

The task focuses on the acquisitions of proportional reasoning and multiplication operations. The students are directed to find out the best option among the bottles. For this reason, they have to find out the relations between the size of bottles and their prices. All prices and sizes are different from others. They also don't know the concepts of common divider and multiple. So, they might use estimations and they might try many experiences. These experiences can develop students' proportional reasoning skills [1]. The task is part of the learning area of measuring. So, the first task just focuses on mathematical reasoning but it implies both the reasons for diversification of bottles and important of saving water. The most limitations about the task that not to show units in details with decimals for both currency and liter. So, the task doesn't include any convert between liter and milliliter or any representation of decimal liters like 0.5 l. the similar situation seems for the relationships between TL and Kr. There is not any representation of the decimal representation of money like 12.50 TL.

The other face of the task is that children might not think about such a situation. Maybe their parents are too. The habits displayed by people are transferred by imitation of their children [2]. The task offers a chance for them to think about it to both children and their parents. Because parents are role-model for their children as well as the children have the potential to affect their parents [3].

[1] NCTM. (2000). *Principles and standards for school mathematics.* VA: Reston.

[2] Jahoda, G. (1983). European ``lag'' in the development of an economic concept: A study in Zimbabwe. *British Journal of Developmental Psychology*, 1, 113-120.

[3] Berti, A., Bombi, A. (1988). *The Child's Construction of Economics,* Cambridge: Cambridge University Press.

Appendix 3 (see online version for colours)

Task 48: The vehicle loan

Gunesbank executes the financial figures in the table as a financial institution. The table includes the formula for vehicle loan calculation as well. There are also 4 examples of financial calculator for loans.

GÜNES BANK	**Gunesbank Loan Information**
Interest rate	1 % (monthly)
Maximum duration	72 months
Formula *A: Amount* *P: Principal* *m: duration (monthly)*	$A = P \,.\, (1.01)^m$
Monthly payment	S/m

GÜNES BANK	**Gunesbank Financial Calculator** *(for vehicle)*
Principal:	100,000.00 TL
duration:	48 months
Amount:	**161, 222. 61 TL**
Monthly payment	**3,358.80 TL**

GÜNES BANK	**Gunesbank Financial Calculator** *(for vehicle)*
Principal:	50,000.00 TL
duration:	48 months
Amount:	**80, 611. 30 TL**
Monthly payment	**1,679.40 TL**

GÜNES BANK	**Gunesbank Financial Calculator** *(for vehicle)*
Principal:	100,000.00 TL
duration:	72 months
Amount:	**204, 709. 93 TL**
Monthly payment	**2,843.19 TL**

GÜNES BANK	**Gunesbank Financial Calculator** *(for vehicle)*
Principal:	50,000.00 TL
duration:	72 months
Amount:	**TL**
Monthly payment	**TL**

a) One of the calculation is not completed. Calculate the figures by using the formulas.

b) Look at the four calculations. What relationships can you recognize between the figures? Are there any relations that don't exist but you would expect? Note your consideration down a paper.

You will use a calculator in this task, especially for the exponentials. Please listen carefully to what the teacher explains using it.

Task 48: The vehicle loan Time: 20 min.

Grade 8

The teachers' column

Learning area: M.8.1. Numbers and operations

Sub-learning area: M.8.1.2. Exponentials

Acquisitions:

M.8.1.2.1. determine whole number exponents of a whole number.

M.8.1.2.2. indicate decimals as exponents of ten.

T: 82,53: $8.10^{1}+2.10^{0}+5.10^{-1}+3.10^{-2}$

Related Acquisitions from the main curriculum

M.8.1.2.3. realize main features of exponentials.

M.8.1.2.4. indicate a numbers with different exponentials of ten.

T: 82.53: $8253.10^{-2} = 8.253x10^{1}$

Relationships to

- *Real life: loan*
- *Other disciplines:*
- **Financial circle:** *loan*

Financial literacy expectations:

-realize the concept of loan and its parameters.

-compare the effect of parameters of a loan.

-estimate of parameters of a loan.

Implementation steps

- First, talk about using a scientific calculator and apply its use.
- Let children try it a little bit.
- Lead them to check the figures in the calculations of loans.
- Discuss the wrong calculations and their reasons.
- Let them find the figures for the last loan.
- Encourage them to note their consideration down a paper.
- Discuss what relations they expect among the figures.
- Probe whether they recognize the difference between the exponential and linear algebraic equations.
- Discuss the effects of the parameters of a loan.
- Discuss whether they know the current ratios on the loans of Banks.
- Discuss why people use loan and whether the interest rate of the loans is reasonable.

Relationships to Pre-learnings

- Operation with natural numbers and decimals
- The order of operations.

Cautions and limitations

- *Cognitive: -don't change the decimals of the interest rate. Focus the relation between the figures of parameters.*
- *International and local values: -Loans is one of the works of banks. Explain what banks do briefly.*
- *Ethics: -mention the concept of interest. Explain why banks use the concept of interest and talk about the type of banks such as the state banks, and Islamic banking systems briefly.*

Behind screen (Background) of the task

***The general framework of the task* 48: The vehicle loan**

A-Financial Circle

- *Financial context: investing and saving (loans) financial management and planning (considering the parameters of loans)*
- *Financial concepts: loan, interest rate, principal, bank*
- *Affecting factors: Banks are a fundamental part of the financial system. Also, they are one of the authorities on financial regulations. Therefore individuals generally, are passive contrary to banks and governments.*

B- Content

- *Quantity: simple operations with whole numbers along with simple additions with decimals, exponentials.*
- *Change and relationship: arithmetic and exponential relations between figures.*

C- Processes

- *Identifying financial situation: -realize the concepts of loan, interest, principal and amount.*

-realize the compound interest

-realize the difference between simple and compound interest.

- *Reasoning: -compare the figures on the calculation of loans.*

-compare the parameters of loans.

-evaluate the loan options in terms of their conditions.

-recognize the difference between arithmetic and exponentials growth.

- *Manipulating and estimating: -realize the calculation of exponentials.*
- *Representing: -Symbolic representation: use percentage, figures and money correctly*

-linguistic representation: use meaningful explanations.

- *Communicating: -discuss the effect of parameters of a loan.*

-discuss the exponential growth.

-discuss the use of the concept of interest in the practices of banks.

-talk about the works of banks.

- *Using technology:-use a scientific calculator effectively.*

***How to be organized the task* 48: The vehicle loan**

The question of "what do banks do?" develops from early ages. Although in the early ages, children consider the banks as a building that gives money, then they mean their functions in time [1]. Loans and interest are the basis of the task as the fundamental concepts of finance. These concepts include mathematical thinking and calculations as well. Therefore the task is in intersection cluster of both areas [2].

The task examines four loans offered from the same bank with the same interest rate. The task aims to mean the effect of the parameters and the relation between the results by using the values in the parameters. Therefore, it purposes students to realize that the difference between the simple and compound interest calculations are based on the relationship between arithmetic and exponential growth [3].

[1] Webley, P. (2005). Children's understanding of economics. *Children's understanding of society*, 43-67.

[2] Özkale A. & Özdemir Erdogan E. (2016). Finansal Matematik Eğitimi Üzerine Teknoloji Kullanımı: Faiz Örneği, WAER Kongresi, Eskişehir, Türkiye.

[3] Song, C. (2020). Financial Illiteracy and Pension Contributions: A Field Experiment on Compound Interest in China. The Review of Financial Studies, 33(2), 916-949.