

Teaching Financial Literacy through Excel Game

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Abstract

Financial literacy become important part of pupil's key competencies. Since financial literacy content personal and family finance based on wider economic understanding it is also important part of life of each human being. Teaching financial literacy is quite complicated because of different level of pupils' individual knowledge and experience, and also quite unattractive due to theoretical background and mathematical apparatus needed. We decided to use game for teaching financial literacy started with already available desk game. However we experienced positive impact of the game we also discovered its limitation. Creation of our own game was solution. The article provides specification of important steps and decisions made during creation as much realistic game as possible, and our experience with game creation in the MS Excel with implementation of selected financial literacy topics to the game environment. It is very difficult to find the proper method for teaching the financial literacy through the games and not to use too much simplification

Vermittlung von Finanzwissen durch Excel-Spiel

Zusammenfassung

Finanzielle Kompetenz wird Teil der Schlüsselkompetenzen der Schüler. In dem Maße, in dem die Finanzkompetenz persönliche und familiäre Finanzen umfasst, die auf breiteren wirtschaftlichen Kenntnissen beruhen, ist sie auch ein wichtiger Teil des Lebens aller Menschen. Die Vermittlung von Finanzkenntnissen ist aufgrund des unterschiedlichen Niveaus der individuellen Kenntnisse und Erfahrungen der Schüler sehr kompliziert und auch aufgrund der Notwendigkeit eines theoretischen Hintergrunds und mathematischen Apparats recht unattraktiv. Aus diesem Grund haben wir uns entschlossen, es zu verwenden, um Finanzwissen über das Spiel zu vermitteln, insbesondere die Brettspielversion für den Anfang. Obwohl wir eine positive Resonanz auf das verwendete Spiel festgestellt haben, haben wir auch Grenzen für dessen Verwendung im Unterricht festgelegt. Deshalb haben wir unsere eigene Version des Spiels entwickelt. Der Artikel enthält daher eine Beschreibung wichtiger Schritte und Entscheidungen, die bei der Erstellung eines neuen, realistischsten Spiels getroffen wurden, sowie unsere Erfahrung bei der Erstellung eines Spiels in MS Excel mit der Implementierung ausgewählter Teile der Finanzkompetenz in die Spielumgebung. Es ist sehr schwierig, geeignete Methoden zum Vermitteln von Finanzwissen durch Spiele zu finden, wobei eine übermäßige Vereinfachung vermieden wird.

Keywords:

financial literacy
gamification
key competencies
teaching pupils

Schlüsselwörter:

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Veredelung
Schlüsselkompetenzen
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1 Introduction

Financial literacy has become area of interest of the educational institutions in Czech Republic in last decades. It is understandable due to fact that the financial literacy represents one of key competencies not only pupils but humans of all age categories. Every one of us is surrounded by various economical processes and we are supposed to make various financial decisions, economic decisions in general respectively. Thus it is really very important to provide each of us with relevant information for such decision making process (Marinič & Javorová, 2017).

While there were very intensive development of the financial markets with corresponding development of the financial products with very difficult background in the Czech Republic after the transformation of the Czech economy in the beginning of 90s the need for developing the competencies in the financial literacy occurs as well. In the first decade of millennium two separate initiatives influenced the financial literacy in the Czech Republic occur.

First one was the changes in the education system – curriculum of the primary and secondary schools has been newly defined by the Framework Educational Programmes (FEPs). These documents have been prepared by Ministry of Education Youth and Sport of the Czech Republic and are obligatory for all schools which are supposed to prepare their own School Educational Programmes (SEPs) according to their material and personal possibilities. FEPs were newly less detailed and leave room for individual grasping of the issues of teaching individual subjects, educational areas respectively. Together with this process of adjusting the educational system following the chosen approach there were various problems encountered in the areas of implementation of the FEPs to the SEPs of individual schools (Marinič & Válek, 2018).

Second initiative which has occurred at the first decade of millennium was the establishing a national financial education strategy and financial standards. However, these government-approved documents were not implemented in newly created FEPs, but were created independently of them. The interconnection was then solved by an elegant way of one-sentence references to the implementation of financial literacy into FEPs, without further elaboration of the issue of this implication. In essence, another document regulating education process at primary and secondary schools was created and these institutions were supposed to implement them.

As mentioned FEPs contained only single-sentence information about the financial literacy itself, however they can be used for wider anchoring the issue of the economic competencies important form financial education, while especially FEPs for secondary schools contain the topic of different economic areas, such as the micro- and macroeconomic foundations, corporate economy or financial markets issues. The strategic documents for financial literacy itself provide better foundation for implementation of the topic to the educational process at schools (Marinič, 2019).

Thus we are able to define the areas important for the financial education with the aim of developing the pupils' financial literacy. Directly connected topics are family budget, pricing mechanism, money and their form, supplemented by the information evaluation, legal awareness, numerical skills. In wider consideration the financial literacy assumes awareness of economic concepts and models, as well as the knowledge about the financial products and possibilities of their use.

Education of the financial literacy in the context of such wide economic areas is very difficult process. To the difficulty of education of the financial literacy contributes also the fact that each pupil has different level of the previous knowledge and preconception. It is due to role of the parents and acquiring original knowledge at a young age in a family circle. This is the general problem of the teaching the financial literacy. It is very difficult to choose the suitable approach to teaching financial literacy to make the teaching attractive and to activate the pupils and to draw them into the learning process.

2 Gamification

As a suitable solution for such initiatives gamification of the teaching of financial literacy seems to be appropriate. There are a lot of the games which can be used for teaching the financial literacy. However there are a lot of complications for such gamification. A lot of games need more time to play that it available in class at schools according to education plan. And also there are the complication with replacement of the frontal education process by the game, thus the lack of the time for mediation of the core topics of the financial literacy or wider economic concepts or models.

Games that can be used for teaching financial literacy and are already used in school include:

- Financial freedom – game simulation of the life of families with the aim to achieve set of financial goals through the use of various financial products
- Oeconomica – game simulation of the business activities with demand and supply implementation
- Cashflow – game based on the books of Kyosaky
- FingrPlay – game of the creation of family budget

The list of games is not complete enumeration of games possible for teaching, but rather the list of the most used games in primary and especially secondary schools. We have to admit, that we used some of the in education process of the future teachers as well. Thus we have our own practical experience as well as the feedback from the students.

The positive information is that the games we used in education process have met with very positive response from the students. However, there were also a gaps of each implemented game. Gaps connected with the game settings itself and also with possible implementation to the teaching process at primary and secondary schools. The main critic was connected with the simplification of the games due to their attractive appearance manifested by excessive simplification of real economic events in life, or strict setting of game options restrictive the possibilities of gamers.

In teaching financial literacy, there have been some areas identified that appear to be problematic and could be solved by gamification. The working group for financial education at the Ministry of Finance of the Czech Republic, and at least marginally the Czech School Inspectorate, deal with the identification of some of the mentioned problematic areas. The main identified areas are:

- Predominant frontal form of teaching, less attractive and activating form of teaching respectively
- Poor training of the financial literacy teachers
- Low financial possibilities of the school for obtaining the suitable teaching aids
- Low involvement of practitioners in financial literacy teaching

The findings of the financial literacy survey among the 15-years old pupils conducted as a part of the international survey named PISA in the year 2012 are slightly contradictory (OECD, 2014). In the Czech Republic, there is above average results for the financial literacy comparing to the other countries involved in the survey, and in addition with the better results in the tasks with higher level of difficulty. Also the information about the qualification of the educators of financial literacy are quite contradictory while according to the results for the survey there are more than 70% of the educators with satisfactory level of expertise. Thus the question remains what is the real situation at the schools especially with the financial literacy education.

<div> <div></div> Statistically significantly above the OECD average-13 <div></div> Not statistically significantly different from the OECD average-13 <div></div> Statistically significantly below the OECD average-13 </div>		
Mean score	Comparison country/economy	Countries and economies whose mean score is NOT statistically significantly different from the comparison country's/economy's score
603	Shanghai-China	
541	Flemish Community (Belgium)	
529	Estonia	Australia, New Zealand
526	Australia	Estonia, New Zealand
520	New Zealand	Estonia, Australia, Czech Republic, Poland
513	Czech Republic	New Zealand, Poland
510	Poland	New Zealand, Czech Republic, Latvia
501	Latvia	Poland, United States
492	United States	Latvia, Russian Federation, France, Slovenia, Spain, Croatia, Israel
486	Russian Federation	United States, France, Slovenia, Spain, Croatia, Israel
486	France	United States, Russian Federation, Slovenia, Spain, Croatia, Israel
485	Slovenia	United States, Russian Federation, France, Spain, Croatia, Israel
484	Spain	United States, Russian Federation, France, Slovenia, Croatia, Israel
480	Croatia	United States, Russian Federation, France, Slovenia, Spain, Israel, Slovak Republic
476	Israel	United States, Russian Federation, France, Slovenia, Spain, Croatia, Slovak Republic, Italy
470	Slovak Republic	Croatia, Israel, Italy
466	Italy	Israel, Slovak Republic
379	Colombia	

Source: OECD, PISA 2012 Database.
 StatLink  <http://dx.doi.org/10.1787/888933094887>

Fig. 1: Comparing countries performance on financial literacy with the comparison to the average of the OECD.

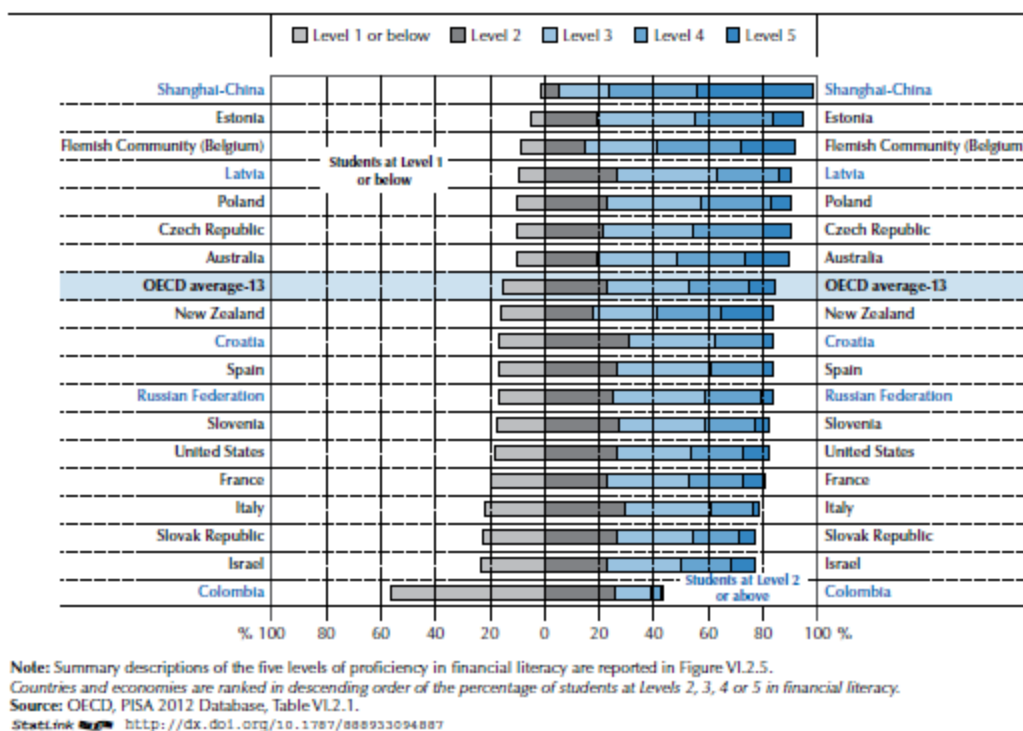


Fig. 2: Percentage of pupils at each level of proficiency in financial literacy

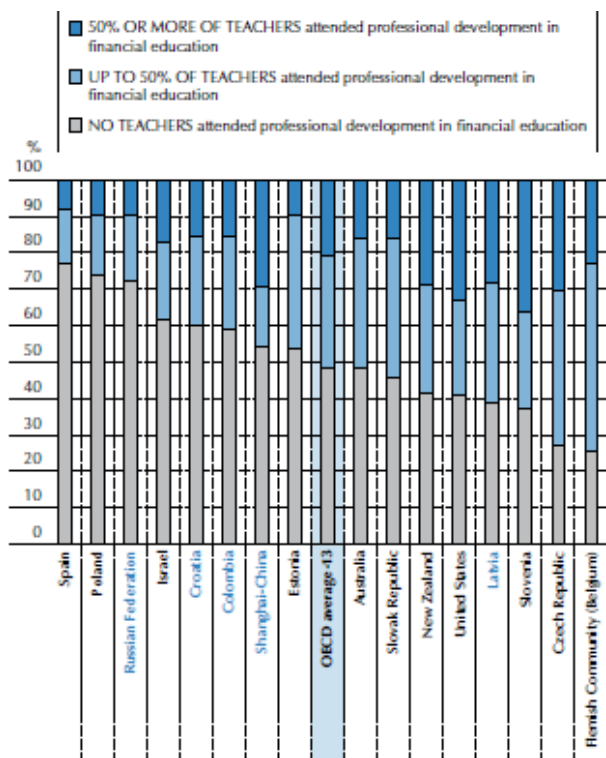


Fig. 3: Percentage of pupils in school where teachers attend professional development in financial literacy

However the education process through the gamification seems to be appropriate tool for developing the financial literacy among the young pupils.

3 Financial literacy

Let us provide the closer attention to the topic of the financial literacy before moving to the analysis of our approach to the creation process of our own game.

Financial literacy thus can be included to the wider context of emerging literacy skills that should be and are implemented at the primary and secondary schools as a result of efforts to maintain the development of the education process with the development of the technologies and society as a whole. Other areas also implemented to the education process as a part of the initiative are media literacy, digital literacy and technical literacy. We have already mentioned the problems with the implementation and subsequent practical application in the real education process.

Financial literacy in this context therefore includes areas of economic focus and are divided into two levels. At the first level, the level of primary components, there are monetary literacy, price literacy and budgetary literacy. The monetary literacy includes information about the form of money, possibilities of using it as a means of exchange, using the credit cards and means of protection in the event of unexpected circumstances. Among price literacy there are areas of producer pricing, both on the basis of business costs and profits, and on the basis of the interaction of the market forces, thus demand and supply, including the competitiveness and marketing approaches of enterprises and the entire sectors. Third component of the primary level of the financial literacy is the budgetary literacy including the asset management and the liability management, thus the information about the financial production available at the financial market for both, appreciation of the assets, especially available money of the individuals or households and for the obtaining the additional assets, especially money, for satisfaction of the individuals or households needs. Thus it includes the information needed for the evaluation of the financial products and their possibilities for use, specifying their advantages and disadvantages. It also include the information about the composition of the individual budget or budget of household.

At the second level, the level of secondary components of the financial literacy, there are numerical literacy, information literacy and legal literacy. Although these components are known as secondary or supportive, they cannot be neglected in financial literacy education. Numerical literacy consists mainly on mathematical abilities, but extended by their possible implementation into a broader economic context. In practice, attention is paid to calculations of interest, the amount of repayments, with subsequent comparison of individual types of savings products and credit options. Legal literacy, which provides information on civil and commercial relationships that pupils can reach in their lives, includes the protection of rights, in the form of consumer protection, protection in the financial markets, and protection of minors' rights, health or other areas, in connection with information on how to deal specifically with individual rights. Information literacy, which is based on the ability of pupils to find relevant information, evaluate the credibility of the source of information and use the information specifically, then complements the supporting components of financial literacy.

This broad spectrum of individual components of financial literacy is included and specified in the form of financial literacy standards within the National Strategy for Financial Education (MFČR, 2010). These standards are formulated for primary school pupils, and for secondary school pupils separately, but they cover the same areas to varying degrees of required competencies. In general, money and payment, prices and inflation, banks and the banking system, the budget, consumer protection or financial products can be identified as key areas covered by financial literacy standards, both for capital appreciation and for solving of their scarcity.

4 Creation process of the Game

As part of the actual creation of our own game for the purpose of education in the field of financial literacy, development of key competences of pupils in the field of financial literacy respectively, we based on the authors and the students of Faculty of Education at Masaryk University personal experiences with the play of selected existing games for the development of financial literacy in the ongoing teaching. We also included identified key areas of financial literacy, resulting both from the broader definition and content of the individual components of financial literacy, and also embedded in financial literacy standards, in the process of creating our own game.

In this context, it is possible to identify the following key areas that a given game must contain in order to satisfy the requirements of sufficient simplification allowing the playability of the platform, and at the same

time meet the sufficient level of expertise of individual parts of the game to be used as an educational aid. These key areas include:

- Household budget – incomes and expenditures with relevant breakdown
- Choice of education with subsequent choice of employment
- Choice between the work time and leisure time
- Possibility of starting a family and potential childcare
- Choice of asset management with different types of financial products
- Possibility of insurance
- Inclusion of pension system
- Including the influence of inflation
- Socio-cultural elements influencing the social status
- Physical condition with the connection to the health status
- Working experience or expertise with relation to education level and duration of employment

From the above mentioned areas, which are included in the game and thus create a playable environment of the game for the development of financial literacy, it is clear that the process of creating the game itself is very complicated and it is necessary to properly implement the individual elements into the game environment.

The game therefore respects the course of life and simulates the consequences of individual economically oriented individual decisions. At the beginning of the game, at the age of 18, the choice of secondary education, the possible continuation of education at university, the associated issue of housing, and the cost of living associated with spending time have to be solved.

There are basically two scenarios. The first one is based on the possibility that the individual decided to become independent, and his choice leads to the first job, finding housing according to available offers on the property market in connection with rent, respectively possibility to buy one's own property, and leisure activities, which manifest themselves in the area of physical possibilities, thus adjusting the level of social status, and the health of the individual.

Basically, the second option is to decide at the beginning of the game to continue the process of education at university, which leads to increased experience but is associated with a loss of household income, or no possibility be employed respectively. In this variant, there is also a need for a housing solution in which there is also the possibility of housing with parents, but reducing the socio-cultural element needed, inter alia, to acquire a life partner. Subsequent choice of employment after completion of the educational process is thus postponed and the initial situation of the player changes significantly. Otherwise, it remains more or less similar to the first variant.

Based on the decisions made, the player can decide to change jobs, supplement education, and spend leisure time in the next stages of life simulated in the game. At its own discretion, player can then decide to acquire a life partner and then to start a family. In this case, there is a need to change the structure of household expenditure, which must include the cost of other dependent persons in the household. The change in costs may then necessitate a change of job where, by bending a random number generator implementing randomness into play, thus leaving the player in a state of unemployment for some time. Furthermore, it decides on the possibilities of spending leisure time and thus maintain the value of the physical condition necessary for work and family life. If the physical condition falls below a certain predetermined value, the player is in danger of deteriorating health, leading to illness, which in turn impedes the employment and thus affects the amount of household income. Possible insurance can compensate the loss of income. The insurance in the gaming platform also applies to other circumstances common in life, the occurrence of which is simulated by a random number generator and linked to the probability of their occurrence in real life.

Another area that enriches the game is to include the possibility of gaining passive income, either through the active use of financial market products, i.e. by purchasing shares, bonds; or by actively acting on the real estate market. There is possibility of investing in housing, which is not primarily intended to meet housing needs, but to rent and increase the income situation of the family.

Inflation in the game affects several areas. Specifically, the income situation of the family through a change in the wage level of the relevant employment opportunities. Influence on changes in the necessary living costs and prices of available leisure activities, or changes in the real estate market and prices or costs of financial products.

Game creates a simulation of a large number of specific real-life situations.

5 Conclusion

The issue of financial literacy and its teaching at primary and secondary schools has recently been a widespread and developing area. Many teaching texts, games and game platforms have been developed in this area, which can be used for teaching at primary and secondary schools. However, these games and gaming platforms either show a high degree of simplicity in the routine of life and economic topics, or are focused only on a particular area of life and economic topics. Alternatively, certain degree of rigidity can be considered as their disadvantage, which was also demonstrated through personal experience with chosen games used in the teaching process at the Faculty of Education at Masaryk University.

Therefore, we have come to the decision to create our own gaming platform, which, as we believe, removes the abovementioned claims against other forms of games. Moreover, the advantage of the game we created is its electronic form, which allows its better use in the real process of teaching at primary and secondary schools. The game can only be introduced during the lessons and the game itself can be left to the pupils in their free time, or they can return to the game repeatedly in several lessons.

Since the created game is a new product created within the pedagogical work of the team of authors at the Faculty of Education at Masaryk University and has so far been only briefly implicated in teaching, we are in the phase of collecting comments and suggestions to eliminate possible mistakes or imperfections of the game itself. It is our hope, the final version of the game would be suitable teaching aid not only for the teaching future educators but also in the current real practical teaching process.

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