We are Landing on Mars! - a Case Study into Key Competences Synergizing to Promote Learners' Engagement

Raquel Pereda Sainz

IES Doctor Sancho de Matienzo, Spain

Silvia Matthies Baraibar

HEOI Bilbao, Spain

Abstract

The Council of the European Union in the Annex to their document Key Competences for lifelong learning: a European Reference Framework defines key competences as those all individuals need for personal fulfilment and development. Key competences are developed in a lifelong learning perspective and through formal, non-formal and informal learning in all contexts, including family and school. The Framework sets out eight competences, one of them being mathematical competence and competence in science, technology and engineering and a second one being multilingual competence. The Framework states all eight competences are equally important and overlap and interlock, as aspects essential to one domain will support competence in another. This paper studies a practical case of non-formal learning where the two competences mentioned above are instrumental. We studied the performance of three very different groups of participants who were invited to watch live the official NASA stream of the Perseverance rover Mars landing on 18 February 2021. The first group were high-school students in a co-ed rural centre. The second was a class of ESL students of different ages in a language school in an urban setting. The third group was an extended family group that comprised male and female members of three generations. The three groups were asked to watch the stream live in their homes and then report on their degree of participation and their response to the stream. Watching the stream was a demanding task, first because of its length and the scientific nature of the topic; secondly, because the stream was in a second language; and finally, because the participants had to deal with the additional stress of the lockdown and the need to use technology some of them were not familiar with. However, the results obtained indicate that the combination of competences required made the task engaging. The results also lead us to propose that quality online experiences should be regarded by educators as a viable alternative to field trips and visits to science centres, above all when engaging learners, and especially female learners, is a priority in activity design.

Key competences, learners' engagement, activity design, gender

1. Introduction

The Council of the European Union in the Annex to their document Council Recommendation of 22 May 2018 on key competences for lifelong learning, *Key Competences for lifelong learning: a European Reference Framework* defines key competences as a combination of knowledge, skills and attitudes. Key competences are those which all individuals need for personal fulfilment and development. They are developed in a lifelong learning perspective, from early childhood throughout adult life, and through formal, non-formal and informal learning in all contexts, including family, school and others. The key competences are all considered equally important. They overlap and interlock; as aspects essential to one domain will support competence in another. The Reference Framework sets out eight competences: literacy competence, multilingual competence, mathematical competence and competence in science, technology and engineering, digital competence, personal, social and learning to learn competence, citizenship competence, entrepreneurship competence and cultural awareness and expression competence. [1] This paper studies a practical case

of non-formal learning in three different groups of participants where the combination of ESL (English as a Second Language) and scientific content encouraged autonomous learning and promoted a positive and proactive attitude towards multilingual competence and mathematical competence and competence in science, technology and engineering.

In addition, the Council of European Union on their document *Council Recommendation* of 22 May 2018 states that Member States should pay special attention to motivating more young people, especially girls and young women, to engage in STEM careers [2] and to making use of good practices to support the development of the key competences, one recommendation being promoting a variety of learning approaches and environments, including the adequate use of digital technologies in education and learning settings [3]. These concerns were central to the design of the activities described in this paper.

2. The context

2.1. The participants

Three very different groups of participants took part in the experience. The first group (Group A) were a class of 4th year ESO students (students doing their last year of compulsory education in Spain) that consisted of 9 students, 5 of them female and 4 of them male. These students were 15 to 16 years old and their English language competence level ranged from B1 to B2. They studied at IES Doctor Sancho de Matienzo, in Villasana de Mena (Burgos). IES Doctor Sancho de Matienzo has around 180 students that come from the Valle de Mena municipality, a valley with an approximate total of 3,700 inhabitants living in 43 villages.

The second group of participants (Group B) was a class of B2 ESL students at HEOI Bilbao, with 21 students, 15 female and 6 male, aged from 23 to 62. Their scientific knowledge went from high-school knowledge to some students having earned a master's degree in science related disciplines. HEOI Bilbao is located in Bilbao (Bizkaia), and takes approximately 6,000 students every year. These students come mainly from Bilbao (approximately 350,000 inhabitants) and its metropolitan area (approximately 1,050,000 inhabitants).

The third group of participants was an extended family group living in the metropolitan area of Bilbao. It comprised 12 people living in 4 different households, 6 of them female and 6 of them male, with ages raging from 6 to 80, knowledge of English from 0 to C2 and a great diversity of scientific knowledge.

2.2. Lockdown

The learning experience took place on the week of 18 February 2021. At the time severe mobility restrictions were being implemented due to COVID-19, with the general population being allowed to go to class and to their workplaces but with public events being cancelled and public gatherings being severely restricted. The participants had to spend most of their free time in their own homes and non-essential travelling was forbidden. In this context, mass media and social media consumption peaked, with NASA Perseverance rover Mars landing mission being widely discussed on television, radio and social media.

3. The activities

After a classroom discussion about the mission, the participants were provided with information on how to watch in their own homes a live stream on the official NASA channel covering Perseverance rover Mars landing. The participants were invited to watch the stream live. The stream was in standard English; it was addressed to the general public and had a strong visual component, which made it accessible to B2 ESL speakers [4] During the class session after the landing, an informal discussion about the stream was held and students were given information about how to download an official NASA boarding pass to their name

to the next Mars mission as well as how to subscribe to NASA RSS Feeds and YouTube channel to receive updates about future space missions.

4. Participants' response

The participants were offered no compensation for watching the stream, obtaining their boarding pass and/or subscribing. Besides, for some participants, logging on happened to be a challenge, as it was the first time they watched a stream live. A number of HEOI Bilbao students did not have a laptop, only a mobile, and had to learn how to share contents so they could watch the stream on their TV sets. This meant that in many cases they had to ask for online technical assistance to friends and relatives. Some of the participants said they expected watching the stream to be a demanding task as they had to watch on their own a long emission in a second language they did not master fully.

However, the participants were excited about trying. Among the reasons listed, watching an event of historical significance and social prestige were prominent. Also, some participants pointed out the fact that the activity offered a vicarious escape from the hardships of confinement and for senior participants watching the stream was a re-enactment of their childhood memories of the first man landing on the Moon. Despite the challenges, these emotional incentives made the task of watching the stream meaningful for them.

As for success rates per groups and gender, 80% of females and 75% of males in Group A watched the stream. The rest of participants in the group logged on but as they found the language barrier too challenging, they stopped watching after a few minutes. Additionally, 40% of females and 50% of males made an online request for further updates on future space missions.

In Group B, 73,33 % of females and 66,66% of males watched the stream, while 6,66% of females and 16,66% of males logged on and found the level of language required too challenging. 20% of females and 16,66% of males did not even try to access the stream. Additionally, 20% of females and 16,66% of males signed up for further online updates on NASA missions.

In Group C, 83,33% of females and 66,66% of males watched the stream, with 16,66% of males logging on and leaving after a few minutes, and 16,66% of males and 16,66% of females not even trying to log on. In this group 83,33% of females and 66,66% of males signed up for future online updates.

If we consider the participants' response by gender, 77% of female participants viewed the stream, whereas 8% logged on and left and 15% did not connect. About male participants, 69% watched the stream, 19% logged on and left and 12% did not log on. 46% of females and 62% of males signed up for future updates on space missions.

The global participants' success rate was as follows: 90,47% of participants logged on the stream, 73% watched the stream and 52,38% registered online for future updates.

5. Conclusions

We are landing on Mars! was a successful example of good practice designed following the guidelines of the Council of the European Union. It had a positive reception both among female and male students from diverse backgrounds and shows how digital non-academic informal learning experiences can be as successful as more traditional non-digital alternatives (like a visit to a museum) when engaging learners, and especially female learners, is a priority in activity design.

Also, learning experiences that require participants to combine multilingual competence and mathematical competence and competence in science, technology and engineering as defined by the Council of the European Union, are attractive to all types of learners, provided that those tasks are meaningful to them (because of personal interest, social prestige or others) and the level of difficulty in terms of second language command and technical content suits the participants' previous knowledge.

Finally, our belief is that there is a fringe benefit of non-academic informal digital learning experiences that should not be disregarded - their potential to engage learners beyond the realm of academic life by offering them the option to subscribe to further content and continue learning on their own.

[1] **Council of Europe** "**Council of the European Union Council Recommendation of 22 May 2018 on key competences for lifelong learning" ST/9009/2018/INIT *OJ C 189, 4.6.2018, p. 10***

[2] **Council of Europe "Council of the European Union Council Recommendation of 22 May 2018 on key competences for lifelong learning" ST/9009/2018/INIT *OJ C 189, 4.6.2018, p.***

[3] **Council of Europe "Council of the European Union Council Recommendation of 22 May 2018 on key competences for lifelong learning" ST/9009/2018/INIT *OJ C 189, 4.6.2018, p. 6***

[4] **Council of Europe Common European Framework of Reference for Languages: Learning, Teaching, Assessment. Companion Volume with new Descriptors, Strasbourg, Council of Europe, 2018, p. 65**