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## SPECIALTY SECTION

This article was submitted to  
Higher Education,  
a section of the journal  
Frontiers in Education

RECEIVED 10 January 2023

ACCEPTED 23 February 2023

PUBLISHED 23 March 2023

## CITATION

Quintana-Ordorika A, Camino-Esturo E,  
Portillo-Berasaluze J and Garay-Ruiz U (2023)  
Integrating COIL in teacher training: An  
estimation of learners' motivational attitudes.  
*Front. Educ.* 8:1141620.  
doi: 10.3389/feduc.2023.1141620

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# Integrating COIL in teacher training: An estimation of learners' motivational attitudes

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Collaborative Online International Learning experiences have gained popularity and presence in the last years, but the motivational impact they have on future Primary Education teachers in the field of teacher training education is to be researched. We present a quantitative study that tries to estimate the level of motivation of teacher training students that are in the trilingual degree in the Basque Country. This study examines the level of confidence, attention, satisfaction and relevance of learners in higher education according to Keller's ARCS model of motivation. It compares the results obtained between learners that have taken part in the Collaborative Online International Learning project, from now on COIL, and those that did not have the opportunity to take part in the virtual exchange and that had to develop the project in the traditional way. It also reflects the opinions they have regarding the general satisfaction of the project. The study involved 43 students from the UPV/EHU (University of the Basque Country) and students from Masaryk University. The data was collected through a validated questionnaire IMMS created in Google Forms. Key findings include that this faculty driven intervention that in all the dimensions, except Satisfaction, show significance results. Therefore, it is confirmed that the dimensions of Attention, Relevance, Confidence, as well as the overall score of the instrument (Global IMMS), show significant differences between the two groups analyzed. The exceptionality of the Satisfaction dimension is very close to the rejection zone of the null hypothesis. This helps us to underline the positive value of the implementation of virtual exchanges and it is therefore concluded that the greater motivation, the higher the degree of positive attitudes towards taking part in virtual exchanges. These results allow decisions to be taken with regard to implementing these experiences in the initial training of teachers, since the data that has been collected has direct implications for global learning engagement level and as an effective pedagogical approach to prepare all students to cope with the requirements that a 21st century society has.

## KEYWORDS

learners' motivation, teacher training education, international education, ARCS, IMMS

## 1. Introduction

In the last decade, the use of global collaborative virtual learning through teams has rocketed in Europe and it has emerged as a pedagogical innovation experience to internationalize the curriculum at many different levels, therefore it has also been named "virtual exchange" (O'Dowd, 2018). Virtual exchange means that international mobility is carried out through

technology instead of physical travel, by allowing students to interact and communicate for educational purposes (Virtual Exchange Coalition, 2019). Through Collaborative Online International Learning (COIL) students in higher education have the chance to live an internationalized education experience as a valuable part of their degree and are valued as useful approaches are a complement to traditionally-delivered courses (De Castro et al., 2019; King Ramírez, 2020) and it represents an emerging pedagogy, associated with the “umbrella” term (O’Dowd, 2021). It gives students and instructors the chance to co-develop a project by collaborating internationally with their peers in an online context (Rubin, 2015).

These “virtual mobility” experiences are embedded into the formal curriculum and provide students an opportunity to interact with their peers, despite having different backgrounds (Guth, 2013), while acquiring digital skills and developing intercultural competences. Moreover, it provides them with a series of attributes, qualities and capabilities that enable them to overcome the challenges of living and working in contemporary societies; it helps them grow as global citizens and professionals (Beelen et al., 2021). According to Guimarães et al. (2019), technologies can support learning practices in the form of hybrid approaches such as COIL to promote global digital citizenship.

The development of digital literacy, or the ability to effectively find, identify, evaluate and use information online, as well as “digital citizenship,” defined as the ability to participate in society online (Mossberger et al., 2008), is also crucial when connecting “virtually” (Harshman and Augustine, 2013). As a consequence, it can be considered a learning paradigm rather than a mere “technological platform” (Rubin, 2017). Hildeblando Júnior and Finardi (2018) and Guimarães et al. (2019) believe that to foster an ecology of knowledge and languages internationalization of higher education is needed, and that more multilingual perspectives such as COIL should be implemented. They also advocate more multilingual, ecological, equitable and meaningful interactions across EU institutions, in order to exchange knowledge.

Although the initial COIL projects were fully coined in 2006 (Rubin, 2017), due to the global coronavirus pandemic, COIL partnership has gained territory in the field of education (Ingram et al., 2021). Before the pandemic, COILs were seen as valuable approaches thanks to the paradigm of innovation that provided students and teachers with an international perspective of global citizenship (Nava-Aguirre et al., 2019; Vahed and Rodriguez, 2021). Moreover, the demand for new innovative approaches such as COILs increased, enabling students to collaborate with peers (Dhawan, 2020; Liguori and Winkler, 2020).

Post-pandemic COIL has turned into an interesting approach to bridge learning internationally (Liu and Shirley, 2021). At the core of COIL pedagogy lays the idea that education should be global, connected, fast-paced, distributed, and hybrid (Levine and Van Pelt, 2021). It can be considered a type of virtual exchange where learners and instructors are involved mutually in projects and can develop intercultural skills and personal abilities despite being far away (Appiah-Kubi and Annan, 2020). Moreover, learning experiences such as COIL are a suitable way to overcome issues such as inequities and travel restrictions in international education and can enhance and foster inclusive global learning in the curriculum (Chan et al., 2022).

Revision of the literature shows that engagement with COIL programs is connected to faculty scholars and teachers’ self-interest

(Mudiamu, 2020). In the research carried out by Schenker (2013), students’ motivation was measured before and after participating in a COIL, the findings show that students were found to have higher levels of motivation before and after the course. Among those experiences in higher education related to COILs it can be stated that learners valued the experience as motivating, and also highlighted that it helped them in getting a better understanding and conceptualization of course content (Skagen et al., 2018). Another study analyzed the preparedness for internalization where students were more open to learning about other cultures, religions and traditions and increased academic efficacy (Naicker et al., 2022). Herrera-Pavo (2021) in their research analyzed how collaborative learning promotes the joint construction of knowledge together with the autonomous management of learning concluding that an enhancement of the everyday use of technologies for teaching and learning practices is achieved. Nevertheless, the literature in general is focused on how COILs are implemented rather than focusing on students’ beliefs.

Therefore, the lack of empirical evidence on this issue not only justifies this study but also makes it relevant, as the results obtained on the motivational level will open new ways towards considering ways of designing future COIL programs that will enhance the motivational level of most students.

## 1.1. ARCS model of motivational design

The ARCS Model of Motivational Design created by John Keller, “the ARCS model,” has been used many times in the field of educational science to test the effects of instructional materials (Keller, 1983, 1999, 2010; Keller and Kopp, 1987). It consists of four subscales that are based on the following bases and principles: attention, relevance, confidence and satisfaction (Keller, 2010, p.44). Keller believes that if the three first motivational principles are achieved (attention, relevance and confidence), people end up being motivated to learn. The feeling of satisfaction with the process or the results of the learning experience (the satisfaction principle) is needed to have a desire to continue to learn. Keller (2010) believes that “each of the four subscales can be used and scored independently” (p.282). According to the chosen ARCS model (Keller, 2015), there has to be a suitable balance between the four categories to achieve motivation.

In our research for the analysis of motivational level, The Instructional Materials Motivation Survey (IMMS) has been used as a 36-item questionnaire to measure people’s reaction to instructional materials (Keller, 2010, p. 283–284).

In recent years, the use of the questionnaire and its revised versions have been used in many educational settings: as an instructional instrument in mixed reality instructional simulation (Hauze and Marshall, 2020); in online instructional materials used to learn and apply Immersive Technology (Nevada State College and Graziano, 2017); in the context of online learning environments to measure learners’ engagement and motivation (Bacquet, 2022).

To test the potentiality of the use of virtual reality in primary education teaching (Villena Taranilla et al., 2022); to analyze the participants’ motivation levels with instructional materials provided in MOOCs (Huang and Hew, 2016); to examine if gamification in the classroom motivates students (Da Silva, 2020). In the research about the potential of Gamified Instructional Materials (GMI) carried out

by Rocel (2022), it was concluded that both the academic performance and intrinsic motivation of the learners were increased.

Refat et al. (2020) used IMMS to test if a mobile-assisted grammar learning tool increases students' motivation after using it. The study reassured that designing effective multimedia based instructions for a mobile-assisted tool not only improved learners' motivational attitude, but it also enhanced their learning performance.

Loorbach et al. (2015) conducted a study in a self-directed learning environment and concluded that a reduced version of IMMS, called RIIMS (Reduced Instructional Materials Motivation Survey) fitted the four factors of the ARCS model with an instrument that consisted of 12 items. In the framework of languages to see if undergraduate students' are motivated to learn English as a second language (Javed et al., 2019).

## 2. Objectives

In order to analyze the possibilities that COIL offers to the teaching degree of education, a research was carried out, with the following objectives:

Objective 1: To find out the degree of motivation that taking part in a COIL project awakens in the teacher training education degree.

Objective 2: To see if there are differences regarding the confidence, attention, satisfaction and relevance between the EHU control group and the COIL experimental group.

## 3. Method

### 3.1. Participants

In order to carry out the intervention, the sample was chosen among the students of the Faculty of Education of the University of the Basque Country that were studying for a trilingual degree in Primary Education teacher training. The selected sample was composed of students that were studying ICT's in the second course of the degree, from which 43 students were randomly selected from a total of 65. From this random sample, two groups of students were formed to carry out the instructional intervention, one as a control group (EHU) with 21 students that carry out all its training in the classroom and which did not collaborate with international students and the other as an experimental group (COIL) with 22 students.

Through this study, we intend to make a comparative study of both groups through their experiences. This type of study allows us to obtain meaningful data that favor research within the university context for the improvement, among other things, of the teaching practice.

In order to justify the choice of the sample in the following lines a brief explanation of the current Basque Educational system is provided. Regarding the sociolinguistic situation of the Basque Country, it must be highlighted that a wide variety of cultures, languages, and ethnic groups live together creating a multilingual and multicultural society (Berasategui Sancho, 2015). According to the Basque educational system, there are two co-official languages Spanish and Basque. The Basque education system structure divides students into three linguistic models according to the instruction language Basque or Spanish. There is also a fourth "trilingual system." In model

A, the language for instruction is Spanish, while Basque is studied as a subject; model B is instructed in both Spanish and Basque; model D (model C does not exist) is instructed in Basque, and Spanish is taught as a subject. Most local students tend to choose model D, while migrant students tend to study in models B or A (Roman Etxebarrieta et al., 2020).

The Basque Government has led several initiatives to foster and promote the use of Basque, ensuring the use of Basque as *lingua franca* in schools and Higher Education and institutions, and results show that Basque in education has increased in the last decades (Urla and Burdick, 2018). As this is the case, future teachers must be competent in the two official languages. This need is reflected in the Basque degrees in primary and early childhood education. According to trilingual education, the Basque Government 1991–92 school-year implemented a strategy to introduce early learning of English in several schools which consisted of a project to teach English to 4-year-olds. Since then the general tendency has been to increase this initiative. The importance of being competent in English is widely accepted in Basque society. Research carried out by several authors such as Lasagabaster (2000) shows that learning English at early stages is not detrimental to learning Basque or Spanish. Having said this the general tendency of the basque society is to foster trilingual education (Basque, Spanish, and English) from an early age (Hoffmann and Ytsma, 2004). In our faculty, the trilingual degree for teacher training has a limited number of European credits assigned for English as a medium of instruction in some subjects, such as ICT. Those students that have chosen to do the second year in the trilingual format will the following year have the option to decide to take a minor course in trilingual education, which focuses on providing most of the subject in English as a medium of instruction.

The reason for the choice of the trilingual group for our COIL experience is precise because of the natural fit of the use of English, already present in part of its subjects, and because it is the group best prepared to lead pioneering internationalization actions in our educational system.

### 3.2. Instrument

For the analysis of motivation, the "Instructional Material Motivational Survey" (IMMS) was used. A Likert-type instrument with five response options (coded 1 to 5), from "not true" to "very true," which aims to collect information on four main dimensions: attention, relevance, confidence and satisfaction. The objectives of our research are on the one hand, to study the motivational level of future educators in both groups and on the other hand, to see how different these responses of the four categories are between the EHU control group and the COIL experimental group. The questionnaire aims to measure the feelings of students (an estimation of learners' motivational attitudes) towards the virtual COIL course they have been participating in.

In the following lines, a brief explanation is given about how we have designed the method of analysis. All the items of the categories (or subscales) were measured on a 5-point Likert scale (coded 1 to 5), from "not true" to "very true" (Table 1).

-Attention refers to the stage where the learners' interest, curiosity about the proposed tasks, assignments and materials is measured

TABLE 1 Items used in the instrument by subscales.

Subscales	items		
<b>Attention</b>	A1. Interest in activities	A2. Quality of the materials	A3. Quality of the sessions
	A4. Attractiveness of the tasks	A5. Captivation level of attention	A6. Suitability of the arrangement of assignments
	A7. Stimulation of curiosity	A8. Avoidance of repetition	A9. Unexpected, new, surprising tasks
	A10. Variety of assignments, illustrations, etc	A11. Style of the writing	A12. Concise and short explanatory instructions
<b>Relevance</b>	R1. Content and materials are related to previous knowledge	R2. Importance level of the tasks	R3. Importance of fulfilment of the COIL
	R4. Relevance of the content	R5. Relevance of the explanations	R6. COIL is worthy, purposeful, advantageous
	R7. COIL is innovative	R8. COIL can be linked to previous knowledge	R9. COIL is useful
<b>Confidence</b>	C1. COIL is effortless/easy to do	C2. The level of difficulty of the tasks	C3. Confidence of achieving in the COIL project
	C4. Facility to remember the important points of the project	C5. Confidence to learn the content	C6. Difficulty of the exercises
	C7. Confidence level to succeed in an assessment or evaluation	C8. General understanding of the materials	C9. The good organization of the COIL
<b>Satisfaction</b>	S1. Feeling of accomplishment	S2. Willingness to know more about it	S3. Enjoyment level of having taken part in the COIL
	S4. The received feedback has been gratifying and fruitful	S5. Feeling good having taken part in the COIL	S6. Feeling pleasure to have taken part in a well-designed COIL project

(Keller, 2015). In our COIL several materials were used to present the teaching materials, such as the quizzes “mentimeters”<sup>1</sup>, ice-breaker

activities or padlets.<sup>2</sup> A total of 12 items were related to the evaluation of attention.

-Relevance is about analyzing the usefulness and applicability of the materials. A total of 9 items were used to measure the relevance, including the importance of fulfilment of the tasks, relevance, usefulness, establishing bridges among new innovative content and previous knowledge.

-Confidence is what learners need to control their learning process and feel able to succeed. In order to achieve this goal, our learners were given the option to choose the design of the plan freely. We just provided students with the evaluation requirements and criteria, by guiding them to be as successful as possible and by giving them continuous feedback both in the asynchronous and synchronous lessons. A total of 9 items measured their confidence level, difficulty of the tasks, understanding of the materials, organization and planning of the COIL.

-Satisfaction was measured by 6 items that included the feeling of accomplishment, willingness to know more, enjoyment in taking part in the project, to measure the feeling about having taken part in the project or the way in which feedback has helped feel rewarded.

### 3.3. Procedure

At the root of this project was the online course “Teacher Training and Innovation Course: COIL” led by the Universidad la Salle Mexico in collaboration with the Compostela Group of Universities. This course allowed each participating teacher to learn the basics of COIL for 6 weeks, to be paired with a colleague from another country and to collaboratively prepare a proposal for a COIL experience. In this way, and as part of the course activities, a first experience design was outlined to be carried out between the universities of Masaryk and the Basque Country. When designing this COIL course the first thing that was considered were the activities that had to be developed; the use of the technology or the technological platform came next (Tuke, 2019). Consequently, the following elements of the way of e-learning and co-teaching were taken into account (De Castro et al., 2019). 1. Content creation; teaching and managing was done collaboratively between the two faculty institutions. 2. The grading was determined by the home institution, despite the fact that all students were enrolled in the same COIL course. 3. Learning objectives were different but the assignments were the same. 4. The projects and exercises were based on active methodologies, in this case problem solving ones. 5. Accessibility and availability of technological resources was based on what each institution and student had.

This faculty-driven curricular intervention design (Rubin, 2017) was decided to put into practice in the second semester of the 2021/22 academic year. In order to do so, it was necessary to detail in depth issues such as: design of common contents but in accordance with the objectives of each subject, creation of the digital environment that allows synchronous and asynchronous interactions (Garrison, 2011), technological support and infrastructure and the calendar of sessions.

The generic COIL methodology specifies three phases with two objectives in each of them: 1. “Icebreaker” PHASE; interacting with

1 <https://www.mentimeter.com>

2 <https://padlet.com>

classmates from the other country and sharing a personal or professional experience. 2. “Collaborative Activity” PHASE; working in a multicultural team and integrating different skills. 3. Final Reflection” PHASE; reflect on the experience and reflect on newly acquired skills.

Regarding the schedule, the COIL was implemented over a period of five weekly sessions of 1 h and 30 min from the 25th of February to the 25th of March 2022. Due to the different timing of the sessions, and the variations in the schedules of each institution the sessions had to be designed in the following way: the previous 45 min were conducted asynchronously and then another 45 min synchronously. Synchronous learning requires all participants to be present, it can be done for instance through videoconferencing, whereas asynchronous learning relies on other platforms such as blogs, wikis, shared documents or forms (Garrison, 2011). The technological platform that was selected was Google Workspace and several of its tools were specifically used. All the content was uploaded in different assignments that were visually and chronologically organized (Assignments); documents and web pages were collaboratively generated and shared (Sites, Drive); blogs were published (Blogger); and synchronous interaction was carried out through videoconferencing (Meet).

This research follows the quantitative method, through a non-experimental descriptive design, the purpose of which is to describe the state of a phenomenon, fact or element in relation to a specific subject or group, as objectively as possible.

In the EHU control group 21 students from our faculty were working on the same curricular content as the COIL experimental group but without taking part in the virtual experience. In the COIL experimental group a group of 22 students from the University of the Basque Country participated in the COIL virtual exchange together with the students of Muni University from the Czechia.

In both groups the instrument used for the collection of information was a self-administered, anonymous and voluntary questionnaire. The data collection was done at the end of the COIL project using google forms, through the 2021–2022 school year. Likewise, this research is classified as cross-sectional, as the data collection is carried out at a specific moment in time, rather than over a specific period of time.

### 3.4. Data analysis

Once the questionnaire was given to the students in the two groups, the data collected was processed using SPSS software, v. 26. The first phase consisted of an evaluation of the reliability of the instrument by calculating Cronbach’s alpha, in order to determine the internal consistency of the different responses.

The second phase consisted of a descriptive analysis with the aim of extracting some general characteristics of both groups. By calculating the percentages of the sample, the different scores of the dimensions (categories or subscales) of the instrument’s scale were classified into different typologies, according to the degree of intensity chosen by each student within the Likert-type response scale (1–5). For this purpose, three typologies were established, according to the degrees of this scale: Low (1–3), medium (3.01–4), and high (4.01–5).

Subsequently, in a third phase, the average scores of each student in each group of items of each dimension were calculated (Table 1)

and, in turn, the global average (Global IMMS) of all dimensions was calculated for each student. Once this operation was completed, the assumption of normality of each of the dimensions was checked, both at the general level of the sample and at the group level. For this purpose, being a small sample (<50), the Shapiro–Wilk statistic was applied and, if there was normality in the distribution of the dimensions, the decision could be made to continue with the analysis of the differences between the control group (EHU) and the experimental group (COIL) by means of a *t*-test contrast test. This implied complying with the assumption of normality and also with the assumption of homoscedasticity or equality between variables, especially necessary in small samples (Molina Arias et al., 2020).

In a concluding phase, we proceeded to the execution of the *t*-test for independent samples, establishing a significance level of  $\alpha=0.05$  with which to reject the null hypothesis (equality between groups) and, consequently, to find statistical evidence showing significant differences between both control and experimental groups, in accordance with the objectives of the study. The dimensions were tested separately, such as, by performing a *t*-test for each of the dimensions and also for the entire scale of the instrument (Global IMMS). To complete the contrast, some coefficients were calculated to measure the effect size of the significant results. In this sense, Cohen’s *d*, correlation coefficient ( $r^{pb}$ ) and the Common Language Effect Size (CL) have been calculated, with which to extract a further development of the *t*-test for independent samples (Ledesma et al., 2008).

## 4. Results

A first approach to the data obtained allows us to visualize the distribution of the two sets of observations and to verify that both groups EHU control group and COIL experimental group are structured in a particular and apparently differentiated way. In this sense, taking into account the response scale, we can establish three typologies. The first is found among those in both groups who answer between levels 1 and 3, corresponding to a low level. Another group of students answered between 3.01 and 4, a medium level of response. And finally, there is a third group with a response level above 4.01 (Table 2).

Taking this classification into account, it can be seen that there are percentage differences between the two groups in all the dimensions of the instrument. While the EHU control group maintains high percentages in the lowest level of the classification (low) in all the dimensions of the instrument, the COIL experimental group minimizes these proportions and, even in some of the dimensions, these students have answered above this (low) level of response.

In general terms, it can be stated that there is a general tendency of most of the pre-service teachers from both analyzed groups to choose the average values (between 3.01 and 4 points). Considering the Global IMMS measurement both the EHU control group and the COIL experimental group maintain approximate percentages (71.40 and 68.20% respectively). However, the most pronounced differences are found at the extremes of the response option, with the COIL group not having an overall percentage below 3 (low level), while the EHU control group has a response percentage in this same level of 14.30%. However, the response rate at the high level for the EHU control group is 14.30%, whereas that of the COIL experimental

TABLE 2 Ranking of response levels by group (%).

		EHU		COIL		Total	
		N	%	N	%	N	%
Attention	Low	5	23,8	2	9,1	7	16,28
	Medium	13	61,9	13	59,1	26	60,47
	High	3	14,3	7	31,8	10	23,26
Relevance	Low	2	9,5	0	0	2	4,65
	Medium	17	81	14	63,6	31	72,09
	High	2	9,5	8	36,4	10	23,26
Confidence	Low	10	47,6	2	9,1	12	27,91
	Medium	8	38,1	13	59,1	21	48,84
	High	3	14,3	7	31,8	10	23,26
Satisfaction	Low	2	9,5	1	4,5	3	6,98
	Medium	16	76,2	13	59,1	29	67,44
	High	3	14,3	8	36,4	11	25,58
Global IMMS	Low	3	14,3	0	0	3	6,98
	Medium	15	71,4	15	68,2	30	69,76
	High	3	14,3	7	31,8	10	23,26

group is 31.80%. It can be stated in a first approximation that the percentages shown in this table allow us to make an initial judgment, with which we can anticipate that the students who have participated in the inter-institutional and intercultural approach are more likely to consider the experience relevant and, in general, they seem to be more satisfied.

We will now proceed to check some aspects necessary to continue with the analysis. In this regard, the reliability analysis of the instrument shows optimal results, especially for the IMMS as a whole ( $\alpha = 0.935$ ), so we can confirm a sufficiently high internal consistency in the survey results, which verifies the validity of the instrument used on the chosen sample (Table 3).

On the other side, regarding the statistical distribution, we can verify the normal distribution of the data by means of the Shapiro–Wilk normality test, both for the responses provided by the two groups analyzed and for the sample as a whole.

In each of these distributions, the variables follow the approximate model of the normal curve, but with a lower value for the Satisfaction and Relevance dimensions, especially in the EHU control group (Table 3).

Finally, having verified the correct consistency of the data obtained by the instrument and the normality of the distribution, we shall proceed to resolve the main objective of this study, which focuses on the hypothesis that the two groups analyzed may have a significantly different level of motivation using two different educational training methodologies. To do so, we will use *t*-test with a significance level of  $p < 0.05$ , with which we will be able to test the initial hypothesis, on the basics of the following premises:

*H0*: there are no differences in motivation between the EHU control group and the COIL experimental group.

*H1*: the different methodologies produce differences between the two groups.

TABLE 3 Cronbach's Alpha values and normality test obtained from the instrument.

	Cronbach's alpha	N of items	Shapiro–Wilk Test		
			EHU	COIL	Total
Attention	0.837	12	0.776	0.94	0.887
Relevance	0.775	9	0.142	0.883	0.345
Satisfaction	0.809	6	0.305	0.894	0.334
Confidence	0.826	9	0.082	0.708	0.175
Global IMMS	0.935	36	0.359	0.499	0.452

In first place, we can appreciate that, initially, there are differences in the average responses between the two groups studied. The EHU control group has, in all the dimensions and in the instrument, total response averages between 3.27 and 3.62 (in a range between 1 and 5). Nevertheless, the COIL experimental group shows response averages between 3.77 and 3.97 (Table 4).

After that, we validated the equality of variances of the two groups by means of Levene's test in all the dimensions and also in the overall sum of the IMMS instrument. Once this assumption had been confirmed, we drew up the *t*-test for the equality of means, which expresses the significant differences that exist between the EHU control group and the COIL experimental group. In this sense the *t*-test shows *p* value below the significance level 0.05 significance in all the dimensions except satisfaction.

In this way, we can confirm the significant difference between the two learning methodologies on the motivational impact observed in the results of the students' final evaluations. This analysis is supported by the calculation of the effect size by means of several techniques. First, all the values obtained for Cohen's *d* coefficient show values around 0.5, with a range between 0.45 and 0.60 for the different dimensions and the overall computation of the instrument. This indicates that the power of the effect size reaches medium values (Cohen, 1988). Subsequently, this result is compared by obtaining average correlation measures between the two groups analyzed (COIL = 0; EHU = 1) and the values of the dimensions by means of correlation coefficient.

The results obtained confirm the Confidence dimension as one of the best correlated ( $r^2: 0.1672$ ) and with a high significant effect ( $p < 0.01$ ), while, on the other hand, the Satisfaction dimension is the one with the lowest intensity, with a determination coefficient of 0.0894, and an adjusted acceptance of the null hypothesis ( $p = 0.51$ ).

In general terms, with respect to the overall power of the intervention, it shows significant mean differences ( $p < 0.01$ ) in favor of the COIL experimental group ( $\bar{x}: 3.869$ ; *S*: 0.456) compared to the EHU control group ( $\bar{x}: 3.492$ ; *S*: 0.450). The methodology of the experimental group shows a better assessment towards the applied learning methodology, with a mean level of the effect size (*d*Cohen: 0.45) produced by the intervention with respect to the control group. In addition, the standardized statistic Common Language Effect Size (CL) shows that there is a 72.2% probability that a person using the methodology applied in the COIL experimental group will obtain a better score on global motivation than a student who learned in the EHU control group.

TABLE 4 Independent samples test and effect sizes for the instrument.

	EHU (n=21)	COIL (n=22)	t-test for equality of means				Effect sizes		
	$\bar{x}$ (S)	$\bar{x}$ (S)	t <sup>a</sup> (df=41)	Sig <sup>b</sup>	Mean difference	Std. error difference	d	r <sub>pb</sub>	CL
Attention	3.45 (0.51)	3.81 (0.52)	2.234	0.031	0.354	0.158	0.5198	0.329*	0.684
Relevance	3.62 (0.41)	3.92 (0.45)	2.231	0.031	0.294	0.132	0.4332	0.329*	0.684
Confidence	3.26 (0.56)	3,77 (0.59)	2.867	0.007	0.502	0.175	0.5750	0.409**	0.732
Satisfaction	3,62 (0.62)	3,97 (0.55)	2.008	0.051	0.358	0.178	–	0.299	0.668
Global IMMS	3,49 (0.45)	3.87 (0.45)	2.729	0.009	0.377	0.138	0.4534	0.392**	0.722

<sup>a</sup>Equal variances assumed. <sup>b</sup>Two-sided  $p < 0.05$ . \*Correlation is significant at the 0.05 level (two-tailed). \*\*Correlation is significant at the 0.01 level (two-tailed).

## 5. Discussion

In the results of this research it has been underlined that taking part in a COIL awakens both motivation and engagement level of the students. When these types of interventions are incorporated into the teaching-learning process, students become active agents. Such findings are in line with those obtained by other authors such as Nava-Aguirre et al. (2019), Mudiamu (2020), and Vahed and Rodriguez (2021).

Results showed that the motivational level scores on the COIL experimental group were significantly higher than in the control group. The purpose of this research was to measure the motivational level of our team’s experience in working on an international, intercultural, collaborative teaching opportunity. Both Muni faculty and the Faculty of education of the Basque Country shared a rewarding experience that in the near future could serve to follow the same pathway and will get the same benefits obtained from academic exchanges. Within the COIL context we have seen that it has enhanced intercultural awareness, the motivational level and that students have been free to explore and create knowledge in an innovative approach; it has provided an experience to “study abroad without leaving home” reassuring the potential it has to establish bridges across countries (Liu and Shirley, 2021).

At the beginning, we found out that the students that were working cross-institutionally were very receptive with the idea of working collaboratively with other students and they saw it as an engaging opportunity to complement the traditionally-delivered course content. The project took place in “real-time” and they were communicating and interacting with each other “Live” simultaneously. Students had the opportunity to interact, engage and collaborate by developing digital skills that are key to life in the 21st century. They actively participated in team-work, they also shared understanding of one another’s societies, ways of living and they interiorized perspectives to develop valuable intercultural skills, while creating a collaborative main task: a blog. While working through COIL, we could observe that mutual understanding and enhancing their ability to effectively communicate and appropriately respond to diverse opinions was also acquired.

When two classes from different parts of the world are working together, intercultural and transnational learning takes place. As a consequence, COIL enables students to interact, collaborate, exchange ideas and make the learning process more meaningful. Working through COIL also enables to achieve intercultural awareness, knowledge in discipline-specific content, and skills in communication

and group collaboration Villar-Onrubia and Rajpal (2016). Authors such as Villar-Onrubia and Rajpal (2016), have seen that while working through COIL the students’ Intercultural Communication capacity for understanding and managing information is also achieved through observation, continuous and active listening and verbal and non-verbal communication.

Teachers report that intercultural awareness has improved and that student motivation has been high. They believe that both providing a “study abroad without leaving home” experience and the freedom to explore and create knowledge in an innovative approach may have been responsible for the high motivation. In any case, further work is planned with a quantitative assessment of the experience, as well as a comparison with a control group.

## 6. Conclusion

A number of conclusions can be drawn from this study, in general the level of satisfaction of the COIL experimental group has been higher and this result reassures the value and potentiality of this type of virtual collaborations, turning them to be a suitable model to apply in other fields.

In general terms it can be stated that the main objectives of the research have been accomplished due to the statistical significant differences between the two analyzed group; as a consequence the intervention can be considered positive. The results provide relevant data to take decisions to improve, through implementing these experiences in the initial training of teachers, learners’ global learning engagement level. It is an effective pedagogical approach to prepare all students to cope with the requirements that a 21st-century society requires. By taking part in this experience pre-service teachers have been active participants in an innovative approach. In the future, they will probably take into consideration the experience and take decisions in favor of implementing and applying similar collaborative (International) projects in their teaching practice.

Nevertheless, this study is not without limitations. First, the sample consisted of students from two universities who were not in the same grade. It is recommended that future research should contrast the data obtained between students of the same degree. It is also believed that the level of faculty motivation along with the benefits gained from participating in a COIL project should be investigated.

All in all, projects such as COIL serve as a source of inspiration for future teachers to be able to implement in their later professional

career inclusive educational programs that are based on attractive and globally relevant educational experiences. It can be considered that thanks to these innovative experiences various interdisciplinary values are disseminated and students become active agents of educational transformation. In terms of providing technological access and literacy to everybody, technologically mediated teaching and learning experiences such as COIL, can be seen as a suitable way to overcome issues such as inequities and travel restrictions in international education and can enhance and foster inclusive global learning in the curriculum (Chan et al., 2022). The future of teaching in higher education is connected to the following elements that are also at the core of COIL pedagogy: education should be global, connected, fast paced, and distributed and hybrid (Levine and Van Pelt, 2021). Future lines of research should consider qualitative and quantitative measurements of the impact of virtual exchanges in higher education.

## Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: <https://doi.org/10.17605/OSF.IO/EA3PQ>.

## Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## References

- Appiah-Kubi, P., and Annan, E. (2020). A review of a collaborative online international learning. *IJEP* 10:109. doi: 10.3991/ijep.v10i1.11678
- Bacquet, Jennifer. (2022). *Dissertation title: Assessing learners' engagement and motivation in the context of online learning -an action research project.* (Doctoral dissertation, University of Leicester (United Kingdom): ProQuest Dissertations Publishing).
- Beelen, J., Wimpenny, K., and Rubin, J. (2021). "Internationalization in the classroom and questions of alignment: embedding COIL in an internationalized curriculum" in *Reshaping international teaching and learning: Universities in the information age.* eds. P. G. Nixon, V. P. Dennen and R. Rawal (London: Routledge), 29–45.
- Berasategui Sancho, N. (2015). La diversidad en la escuela desde la perspectiva lingüística y cultural. *Opción* 31, 128–144.
- Chan, R.Y., Bista, K., and Allen, R.M. (2022). "Epilogue: The future of online teaching and learning in higher education after COVID-19: Lessons learned and best practices," in *Online Teaching and Learning in Higher Education during COVID-19* (Routledge) 241–243.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.
- De Castro, A. B., Dyba, N., Cortez, E. D., and Pe Benito, G. G. (2019). Collaborative online international learning to prepare students for multicultural work environments. *Nurse Educ.* 44, E1–E5. doi: 10.1097/NNE.0000000000000609
- Dhawan, S. (2020). Online learning: a panacea in the time of covid-19 crisis. *J. Educ. Technol. Syst.* 49, 5–22. doi: 10.1177/0047239520934018
- Garrison, D. R. (2011). *E-learning in the 21st century: A framework for research and practice.* London: Routledge, doi: 10.4324/9780203838761.
- Guimarães, F. F., Mendes, A. R. M., Rodrigues, L. M., Paiva, R. S. D. S., and Finardi, K. R. (2019). Internationalization at home, COIL and Intercomprehension: for

## Author contributions

AQ-O and JP-B contributed to conception and design of the study and organized the database. EC-E performed the statistical analysis. AQ-O and EC wrote the first draft of the manuscript. AQ-O, JP-B, EC-E, and UG-R wrote sections. All authors contributed to manuscript revision, read, and approved the submitted version.

## Funding

Funding for research teams with the project, "Development of STEAM education through the design and implementation of MAKERSPACES."

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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more inclusive activities in the global south Simon Fraser University. *Educ. Rev.* 12, 90–109. doi: 10.21810/sfuer.v12i3.1019

Guth, S. (2013). *The COIL Institute for globally networked learning in humanities.* Available online at: [http://coil.suny.edu/sites/default/files/case\\_study\\_report.pdf](http://coil.suny.edu/sites/default/files/case_study_report.pdf)

Harshman, J. R., and Augustine, T. A. (2013). Fostering global citizenship education for teachers through online research. *Educ. Forum* 77, 450–463. doi: 10.1080/00131725.2013.822040

Hauze, S., and Marshall, J. (2020). "Validation of the instructional materials motivation survey: Measuring student motivation to learn via mixed reality nursing education simulation" in *Proceedings of International Journal on E-Learning 2020*, Ed. G. Marks Waynesville NC USA: Association for the Advancement of Computing in Education (AACE). 49–64.

Herrera-Pavo, M. Á. (2021). Collaborative learning for virtual higher education. *Learn. Cult. Soc. Interact.* 28:100437. doi: 10.1016/j.lcsi.2020.100437

Hildeblando Júnior, C. A., and Finardi, K. R. (2018). Internationalization and virtual collaboration: insights from coil experiences. *Ensino Em Foco.* 1, 19–33. doi: 10.55847/ef.v1i2.519

Hoffmann, C., and Ytsma, J. (2004). *Trilingualism in family, school, and community* Multilingual Matters. 250.

Huang, B., and Hew, K. F. (2016). Measuring learners' motivation level in massive open online courses. *IJIEET* 6, 759–764. doi: 10.7763/ijiet.2016.v6.788

Ingram, L. A., Monroe, C., Wright, H., Burrell, A., Jenks, R., Cheung, S., et al. (2021). Fostering distance education: lessons from a United States-England partnered collaborative online international learning approach. *Front. Educ.* 6:2674. doi: 10.3389/feduc.2021.782674

Javed, F., Saher, N. U., and Baig, S. (2019). Investigating ESL learners' motivation through ARCS motivational design model. *Glob. Reg. Rev.* IV, 524–534. doi: 10.31703/grr.2019, iv-iii).56



- Keller, J. M. (1983) in *Instructional-design theories and models: An overview of their current status*. ed. C. M. Reigeluth (Lawrence Erlbaum Associates)
- Keller, J. M. (1999). Using the ARCS motivational process in computer-based instruction and distance education. *New Dir. Teach. Learn.* 1999, 37–47. doi: 10.1002/tl.7804
- Keller, J. M. (2010). *Motivational design for learning and performance: The ARCS model approach*. New York, NY: Springer, doi: 10.1007/978-1-4419-1250-3
- Keller, J. M. (2015). *Instructional design models and theories: Keller's ARCS model of motivation*. Available online at: <https://elearningindustry.com/arcs-model-of-motivation>
- Keller, J. M., and Kopp, T. W. (1987) "An application of the ARCS Model of Motivational Design," in *Instructional theories in action. Lessons illustrating selected theories and models*. ed. C. M. Reigeluth (Lawrence Erlbaum Associates), 289–320.
- King Ramírez, C. (2020). Influences of academic culture in collaborative online international learning (COIL): differences in Mexican and U.S. students' reported experiences. *Foreign Lang. Ann.* 53, 438–457. doi: 10.1111/flan.12485
- Lasagabaster, D. (2000). "Three languages and three linguistic models in the Basque educational system" in *English in Europe: The acquisition of a third language*. eds. J. Cenoz and U. Jessner (Multilingual matters)
- Ledesma, R., Macbeth, G., and Cortada de Kohan, N. (2008). Tamaño del efecto: revisión teórica y aplicaciones con el sistema estadístico ViSta. *Revista latinoamericana de psicología* 40, 425–439.
- Levine, A., and Van Pelt, S. (2021). *The great upheaval: Higher education's past, present and uncertain future* John Hopkins University Press.
- Liguori, E., and Winkler, C. (2020). From offline to online: challenges and opportunities for entrepreneurship education following the covid-19 pandemic. *Entrepr. Educ. Pedagogy* 3, 346–351. doi: 10.1177/2515127420916738
- Liu, Y., and Shirley, T. (2021). Without crossing a border: exploring the impact of shifting studyabroad online on students' learning and intercultural competence development during the COVID-19 pandemic. *Online Learn.* 25, 182–194. doi: 10.24059/olj.v25i1.2471
- Loorbach, N., Peters, O., Karreman, J., and Steehouder, M. (2015). Validation of the instructional materials motivation survey (IMMS) in a self-directed instructional setting aimed at working with technology: validation of the IMMS. *Br. J. Educ. Technol.* 46, 204–218. doi: 10.1111/bjet.12138
- Molina Arias, M., Ochoa Sangrador, C., and Ortega, P. E. (2020). Comparación de dos medias. *Pruebas de la t de Student. Evid Peditr.* 16:51
- Mossberger, K., Tolbert, C. J., and McNeal, R. S. (2008). Excerpts from digital citizenship: The internet, society, and participation (Cambridge, Mass: MIT Press, 2007). First Monday.
- Mudiamu, S. (2020). *Faculty use of collaborative online international learning (COIL) for internationalization at home* (Doctoral dissertation, Portland State University Library, Google).
- Naicker, A., Singh, E., and Van Genugten, T. (2022). Collaborative online international learning (coil): preparedness and experiences of south African students. *Innov. Educ. Teach. Int.* 59, 499–510. doi: 10.1080/14703297.2021.1895867
- Nava-Aguirre, K. M., García-Portillo, B. I., and Lopez-Morales, J. S. (2019). "Collaborative online international learning (COIL): an innovative strategy for experiential learning and internationalization at home" in *The Palgrave Handbook of Learning and Teaching International Business and Management*. eds. M. A. Gonzalez-Perez, K. Lynden and V. Taras (Springer International Publishing AG), 721–746.
- Nevada State College, and Graziano, K. (2017). Immersive technology: motivational reactions from preservice teachers. *Inter. Learn.* 6. doi: 10.18278/il.6.1.4
- O'Dowd, R. (2018). From telecollaboration to virtual exchange: state-of-the-art and the role of unicollaboration in moving forward. *J. Virt. Exchan.* 1, 1–23. doi: 10.14705/rpnet.2018.jve.1
- O'Dowd, R. (2021). Virtual exchange: moving forward into the next decade. *Comput. Assist. Lang. Learn.* 34, 209–224. doi: 10.1080/09588221.2021.1902201
- Refat, N., Kassim, H., Rahman, M. A., and Razali, R. B. (2020). Measuring student motivation on the use of a mobile assisted grammar learning tool. *PLoS One* 15:e0236862. doi: 10.1371/journal.pone.0236862
- Rocel, M. (2022). Increasing learner's performance and intrinsic motivation using gamified instructional materials: the ARCS model approach. *Int. J. Adv. Res. Innov. Ideas Educ.* 8, 2446–2458.
- Roman Etxebarrieta, G., Pérez-Izaguirre, E., and Langarika-Rocafort, A. (2020). Teaching minority languages in multiethnic and multilingual environments: teachers' perceptions of students' attitudes toward the teaching of basque in compulsory education. *Educ. Sci.* 10:25. doi: 10.3390/educsci10020025
- Rubin, J. (2015). *Faculty guide for collaborative online international learning course development*. 4. Suny Coil Center. Available online at: [http://www.ufic.ufl.edu/UAP/Forms/COIL\\_guide.pdf](http://www.ufic.ufl.edu/UAP/Forms/COIL_guide.pdf)
- Rubin, J. (2017). Embedding collaborative online international learning (COIL) at higher education institutions. *Internationaliz. Higher Educ.* 2, 27–44.
- Schenker, T. (2013). Intercultural competence and cultural learning through telecollaboration. *CALICO J.* 29, 449–470. doi: 10.11139/cj.29.3.449-470
- Silva, J. B. Da. (2020). GAMIFICAÇÃO NA SALA DE AULA: AVALIAÇÃO DA MOTIVAÇÃO UTILIZANDO O QUESTIONÁRIO ARCS. *Revista Prática Docente*, 5, 374–390. doi: 10.23926/rpd.2526-2149.2020.
- Skagen, D., McCollum, B., Morsch, L., and Shokoples, B. (2018). Developing communication confidence and professional identity in chemistry through international online collaborative learning. *Chem. Educ. Res. Pract.* 19, 567–582. doi: 10.1039/C7RP00220C
- Tuke, G. (2019) COIL course planning and design. *Presentation at the Portland State University Faculty scholars COIL workshop*, Portland, Oregon: Portland State University. Available online at: <https://www.tukeinternationalconsulting.com/resources.html>
- Urla, J., and Burdick, C. (2018). Counting matters: quantifying the vitality and value of Basque. *Int. J. Sociol. Lang.* 2018, 73–96. doi: 10.1515/ijsl-2018-0015
- Vahed, A., and Rodriguez, K. (2021). Enriching students' engaged learning experiences through the collaborative online international learning project. *Innov. Educ. Teach. Int.* 58, 596–605. doi: 10.1080/14703297.2020.1792331
- Villar-Onrubia, D., and Rajpal, B. (2016). Online international learning: Internationalising the curriculum through virtual mobility at Coventry University. *Pers. Policy Prac. Higher Educ.* 20, 75–82. doi: 10.1080/13603108.2015.1067652
- Villena Taranilla, R., Cózar-Gutiérrez, R., González-Calero, J. A., and López Cirugeda, I. (2022). Strolling through a city of the Roman empire: an analysis of the potential of virtual reality to teach history in primary education. *Interact. Learn. Environ.* 30, 608–618. doi: 10.1080/10494820.2019.1674886
- Virtual Exchange Coalition. (2019). Available at: <http://virtualexchangecoalition.org/>