Co-funded by the
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ANALYSIS OF POSSIBILITIES TO DEVELOP HYBRID-SIMULATION TRAINING IN AIDLEARN (PORTUGAL)

2021

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HYBVET

Project name: “Development of hybrid training in VET”
Project No. 2020-1-LT01-KA226-VET-094679

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2021

Project partners:

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The project “Development of hybrid training in VET" is funded by the European Union programme "Erasmus+"

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Abstract

This country case study is part of the Study of the specificities, context and perspectives of VET in Lithuania, Latvia, Estonia, Spain and Portugal. At the same time, the readiness and potential of AidLearn to undertake the development of a specific VET new program or module or the adaptation of an existing program through hybrid simulation training will be analysed.

This case study from Portugal will form the basis for an agreement between the "Development of hybrid training in VET" project (No. 2020-1-LT01-KA226-VET-094679) partners on the next phase of the project and for the assignment of specific responsibilities to each partner.

This case study will answer what is the most relevant profession in Portugal for AidLearn to address by hybrid training.

Accordingly, AidLearn will also be able to identify key selection parameters and form a preliminary team of VET teachers who will be trained to use and manage the hybrid simulation training as well as to prepare hybrid simulation training materials.

Introduction

AidLearn, created in December 2003, resulted from the union of professionals with diversified experience in the fields of Management, Economics, Human Resources Management and Psychology, in the Clinical, Social and Organisational areas.

It is a Training, Research-Action and private Consulting company, which operates at national level and the European Union, dedicated to the design, implementation and evaluation of studies, projects and training activities that promote individual and / or organisational development.

AidLearn is a training organisation certified by DGERT (Directorate-General for Employment and Labour Relations) in various areas of education and training.

The AidLearn working areas result from the interface between its vision, the perceived opportunities and the experience accumulated by its collaborators, which has allowed to make an appropriate contribution to the development of competencies, innovation and organizational competitiveness.

AidLearn stands for an articulated development in networks, both at national and European level, which allows to add value to its production chain. Using collaborative work dynamics and flexible structures, AidLearn is attentive to new opportunities and the acceptance of new challenges, in order to respond flexibly to the demands of a constantly changing world.

Those networks are integrated by different types of organisations, such as: non-profit associations; non-governmental organisations; vocational education and training organisations; human resources and consultancy organisations; private companies; universities and research centers; public bodies and operating into different fields of economy and knowledge areas.

Synergy, collaborative networks and project work, more than a methodology, are the essence of AidLearn' s organisational culture. This reinforced by the AidLearn pool of experts who advise the company on the definition of its strategic activity plan, and which also meet extraordinarily, whenever considered relevant.

Expert advice takes place in compliance with the principles of cooperation, complementarity, gratuity, responsibility and convergence, allowing for real business synergies, expanding the repertoire of available knowledge and skills, gaining scale and overcoming challenges in collaboration, in favour of individual and or organisational goals.

Made up of academics, consultants, trainers, managers, etc., specialized in the different areas of interest of the company - existing or in prospect, they not only help to establish the main strategic development lines of the activity, but also occasionally integrate AidLearn project teams (training, consulting or project), whenever deemed pertinent by both parties, following its development from beginning to end and in accordance with a specific agreement to be drawn up on a case-by-case basis.

Innovative proposals in education/training systems and diversification of company training offer are established, largely, on methodologies and products developed in studies and projects, many carried out in transnational teams, through research-action and transnational projects implementation.

This and taking into consideration the learning needs of its clients (individual and companies), but also resulting from debates, experience sharing and dissemination of good practices at conferences and events promoted by AidLearn and focused in its areas of interest and work.

The focus on individual and/or organisational “tailored” solutions, designed to meet diagnosed needs and established targets may cover several stages, from the study, diagnosis, counselling and consulting to planning, management, monitoring and evaluation of interventions for the development of competencies and the management of organisational change.
Briefly, we are a learning organisation that constantly tries to renew the practices in use and expand existing cooperation networks, national and European, without ceasing to be the same, that offers solutions for the reinvention/transformation of the client-companies, for the establishment of an environment where collaborators may develop personally and professionally, while contributing to organisational goals.

Vocational training is a comprehensive and permanent process by which individuals acquire and / or develop knowledge and skills for the pursuit of a professional activity, better adaptation to technological and organisational changes, favouring their conditions of employment. Training individuals and groups is both a strategic tool of skills management for development, innovation and organizational competitiveness.

But adult education/training is not limited to its most labour dimension. It is an inalienable right of adults of all ages and also a funding tool for personal development, cultural and social cohesion and civic participation.

Trainers / educators play a key role, being the guarantor of the quality of education / training in the country. AidLearn develops training of trainers (initial and continuing) since 2005, and its Pedagogical Training Course for Trainers is homologated by the IEFP.

AidLearn is a training provider organisation certified by DGERT in the following areas of education / training:

Training of Trainers / Teachers and Educational Sciences: 146 – Training of teachers and trainers in technological areas;
Arts: 213 – Audiovisual and media production;
Business Studies: 341 - Trade; 342 - Marketing and advertising; 346 - Secretariat and office work;

ICT: 481 – Computer sciences;
Manufacturing: 541 - Food industries;

Social Services: 762 - Social work and guidance;
Safety Services: 862 - Safety and hygiene at work;
Personal Services: 812 - Tourism and leisure; 814 - Domestic services.

In addition to the previous areas, AidLearn has defined as a priority for the coming years the expansion of its activity in the area of dental medicine (724.01), following the work already started at the end of last year, with the design and availability of the initial pedagogical training of trainers' course for dentists, at their request.

The consulting activity has been made in the national space and the EU, with organisations in various economic sectors, such as food industries, funerals, mining industry, ceramics, tourism (hotels, restaurants, entertainment and adventure), health, education / training or services.
This experience allowed to develop and consolidate relevant expertise in making diagnoses; counselling and preparation of business plans; project design, implementation and evaluation of projects; consulting to managers / entrepreneurs on business strategy and organisational development; development of balance of competencies; management training projects and research-action; planning, organisation and training management; marketing plans, highly customized strategic consulting in HR and training.

The consulting service (organisational development and competencies) provided mostly to micro, small and medium business clients, has shown the methodology of training-action as particularly suited to their specific needs, and we continue to invest in this intervention model.

In short, AidLearn implements consulting services aligned with business, supporting companies in their activity and in achieving their strategic objectives.

1. Problem, object and purpose of the analysis

The problem of the research is whether AidLearn has the right conditions, resources, sufficient abilities, measured need and high motivation to apply the hybrid-simulation training method in its activities.

The object of the research is the portfolio of vocational training programs implemented by AidLearn.

The aim of the research is to identify the most promising (most significant) economic activities (sectors) of Portugal's economy, for which the required specialist training programs (or their parts) could be implemented in the future using the applied hybrid-simulation training method.

In the first step of this research, a working meeting was held with members of the company's expert pool, those responsible for AidLearn training and the management board, in order to validate the adequacy, interest and motivation to apply hybrid-simulation training method, as well as verifying which areas would have the best conditions for its application, having as reference, at this starting point, chiefly the expertise, conditions and the strategic aims outlined by the company.

It was concluded that the analysis should focus on:
- Safety and hygiene at work, as it is a cross-cutting theme in which AidLearn has been carrying out and has scheduled training in the future, within the scope of the mining industry;
- Food (trade) Industry, once the company has been providing regular training courses in this area, in different themes, and its continuation is already assured in the near future,
- Funeral sector, an area in which AidLearn has been working and where the company clearly differentiates itself from the training offer of the competition and
- Dental medicine, given the recognise need for further training of dentists for their employability

and competitiveness improvement, meeting the company's strategic development plan and taking advantage of established contacts, achieving a more effective and extended collaboration with relevant stakeholders in the sector.

2. Assumptions of the analysis

Secondly, it was reviewed the structure of the national economy and the impact of the previous mentioned economic sectors on the national economy, taking into consideration:

1. the number of employees by sector under analysis
2. how much taxes are paid by companies in the sectors under analysis
3. what the labour productivity of persons working in enterprises by sector under analysis

The results of the review of the listed aspects will provide a basis for selecting one Portuguese economic sector (Part 3.4 of this analysis), for which the training of the required specialists will be the most relevant in the future. Accordingly, it will help to decide which vocational training content hybridization or the development of completely new hybrid training content makes the most sense, taking also into account the company's strategy and the resources available for this purpose.

3. Analysis of Portugal's economic trends and prospects

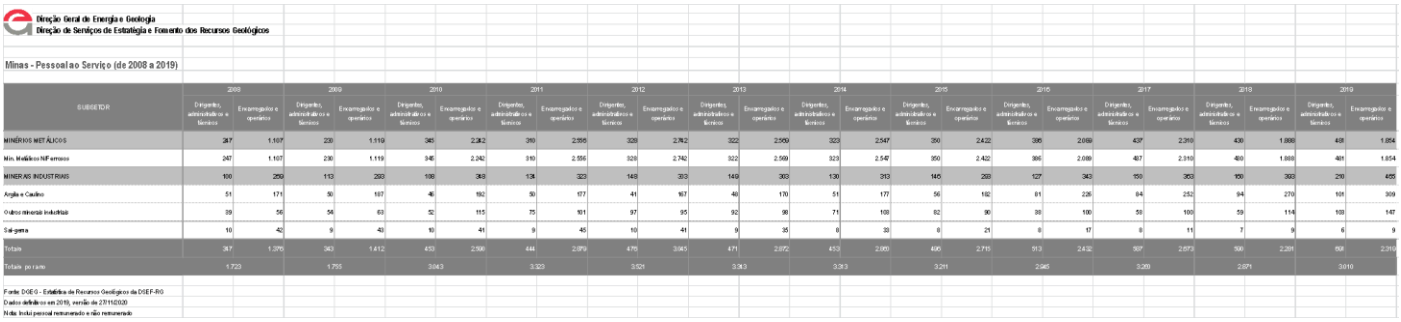
3.1. Number of persons employed by sector under analysis

Mining Industry

In general, the industrial sector employs 25% of the workforce and contributes to 18.9% of Portugal's GDP. Main sectors activities are metallurgy, machinery, electrical and electronics industries, mechanical engineering, textiles and construction. 12% of the GDP is made up by the manufacturing sector alone[1]

In Portugal, the mining industry employed 3010 people in 2019[2]. Whilst this number appears to be somewhat stable (see Figure 1), It should be noted, however, that the mining industry has been identified as an underexplored area, taking into account the geological potential of Portugal[3].

This is confirmed, namely, with the emergence of Portugal as a key player when it comes to lithium supply, which promises to foresee the strengthening of the mining industry´s relevance in the country's economy[4].


Direção Geral de Energia e Geologia
Direção de Serviços de Estratégia e Fomento dos Recursos Geológicos

Minas - Pessoal ao Serviço (de 2008 a 2019)

SUBSETOR	2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários	Dirigentes, administrativos e técnicos	Encarregados e operários
MINÉRIOS METÁLICOS	267	1.107	230	1.119	345	2.242	310	2.555	328	2.742	322	2.569	323	2.547	350	2.422	395	2.089	437	2.310	430	1.888	401	1.854
Min. Metálicos NF ferrosos	247	1.107	230	1.119	345	2.242	310	2.555	328	2.742	322	2.569	323	2.547	350	2.422	395	2.089	437	2.310	430	1.888	401	1.854
MINERAIS INDUSTRIAIS	100	259	113	293	198	368	178	323	148	303	149	303	130	313	145	293	127	343	159	353	159	393	216	455
Argila e Caulino	51	171	50	197	46	192	50	177	41	167	46	170	51	177	56	192	61	228	64	252	94	270	101	309
Outros minerais industriais	39	56	56	63	52	115	75	101	97	95	92	98	71	100	82	90	38	100	59	100	59	114	103	147
Sal-gema	10	42	9	43	10	41	9	45	10	41	9	35	8	33	8	21	8	17	8	11	7	9	6	9
Totais	367	1.366	343	1.412	453	2.610	444	2.878	476	3.045	471	2.872	453	2.860	495	2.715	513	2.432	597	2.673	589	2.281	617	2.310
Totais por ano	1.733		1.755		3.063		3.323		3.521		3.343		3.313		3.211		2.945		3.270		2.871		3.010	

Fonte: DGEG - Estatística de Recursos Geológicos da DSEF-RG
Dados definitivos em 2019, versão de 27/11/2020
Nota: Inclui pessoal remunerado e não remunerado

Figure 1- number of people employed in mines from 2008 to 2019

[1] In https://www.nordeatrade.com/en/explore-new-market/portugal/economical-context)

[2] In https://www.dgeg.gov.pt/pt/estatistica/geologia/

[3] In https://www.dgeg.gov.pt/media/qf0nzutj/i012627.pdf and http://www.euromines.org/files/publications/mining-journal-feature-december-2013-portugal.pdf

[4] In https://uk.practicallaw.thomsonreuters.com/w-019-2521?transitionType=Default&contextData=(sc.Default)&firstPage=true

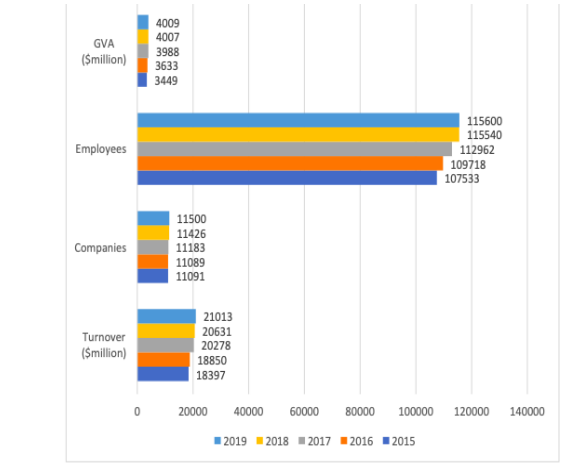
Food (trade) Industry

The agricultural sector employs 6% of the active Portuguese population (World Bank, 2020). The main crops produced include cereals, fruits, vegetables and wine[5]

According to the INE Labour Force survey 2020, agriculture, hunting, animal production, fishing and forestry employed 5.5%, while 24.7% were employed in industry, construction, energy and water[6].

In a report by AICEP Portugal Global, in 2013, 661.000 people were employed in the agriculture, fishing and food industry in Portugal, with 9617 direct jobs in the meat sector and 2267 in the bakery and confectionery sector[7].

With regards to the Food Manufacturing Industry, numbers are presented in the next figure. Since 2015, the Portuguese food and beverage processing companies increased steadily. In 2019 there were 115,600 employees (+8,067 compared to 2015) in this sector[8]



Source: Prepared by Arcadia based on https://www.fipa.pt/estatisticas/dados-macroeconomicos-industria-alimentar%20 (2019 - estimated data by FIPA)

Figure 2- characteristics of the Portuguese Food Manufacturing Industry

Dental Medicine

In Portugal (2019), there was a total of 10 653 dentists registered in the dentist doctor's order, and from those, 9 385 were estimated to be actually employed in the sector and exclusively labouring in Portugal. Additionally, there are 1 606 dentists with a suspended registration in the dentist doctor's order.

Figure 3- Dentists registered in the dentist doctor's order (Source: OMD)

[5] In https://www.nordeatrade.com/en/explore-new-market/portugal/economical-context

[6] In https://ec.europa.eu/eures/main.jsp?catId=2645&countryId=PT&acro=lmi&lang=en&regionId=PT0&nuts2Code=%20&nuts3Code=&regionName=National%20Level

[7] In https://www.een-portugal.pt/destaque/Documents/agriculture-fishing-food_en.pdf

[8] In https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=The%20Portuguese%20Food%20Ingredients%20Sector%20_Madrid_Portugal_03-09-2021

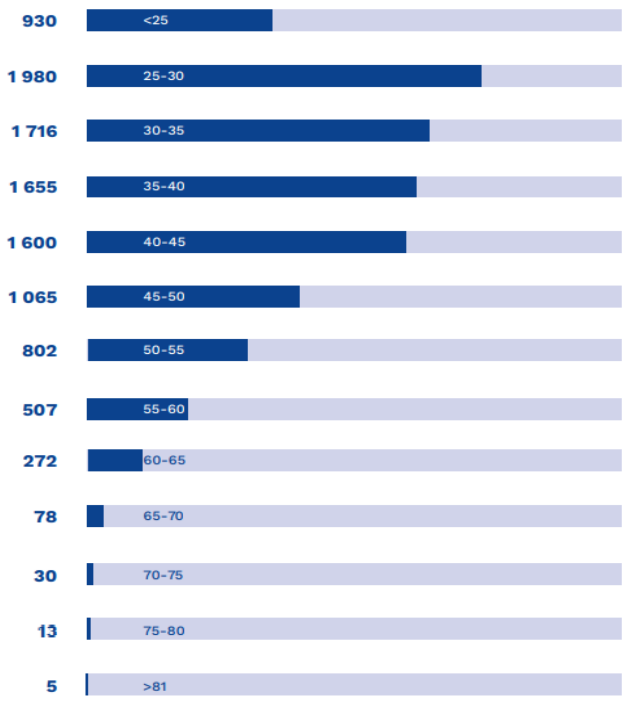


Figure 4- Dentists registered in the dentist doctor's order, by age - mean 39 years old (Source: OMD)

Regarding future trends, the Portuguese Dentist Doctor's Order (OMD) forecast an annual growth rate of 4,3% in dentists practicing the profession in Portugal. These 2018 estimations forecast 10 108 dentists in 2019, 10 468 dentists in 2020, 10 852 dentists in 2021, and 11 274 dentists in 2022[9].

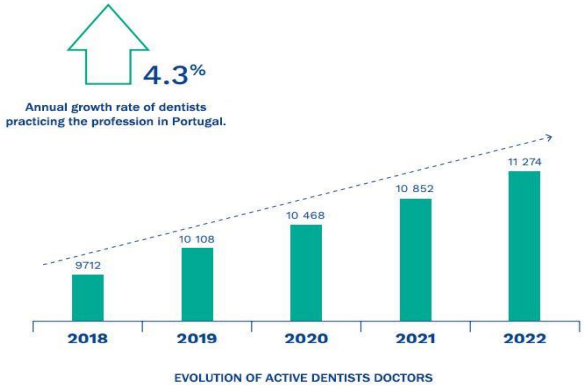


Figure 5- Active dentists in Portugal - forecast (Source: OMD)

But in 2020 the OMD actually listed 11,640 professionals with active registration, meaning one dentist for every 884 inhabitants, which exceeded the Order's already positive growth expectations.

Funeral Sector

In Portugal, there are currently about 1000 funeral agencies, corresponding to around 1400 funeral homes (in Observador, 2016[10]) and 5000 people employed in the sector (in Aljazeera, 2021[11]).

Regarding coffin manufacturers, there are about 30 companies producing it, being located mainly in the north of the country (namely in Amarante, where 80% of the coffins are manufactured) (in Observador, 2016).

In 2017, funeral homes earned 192 million euros, and the estimated value of the whole industry was around 350 million euros (in Expresso, 2017[12]).

Regarding the services of tanatopraxia and tanatoesthetics in Portugal, they can be around 400€ to 800€, although always depending on the specific service required (in Público, 2011[13]).

But there is not that much data on this sector. Besides, tanatopraxia was only officially legislated by the government in 2015 (Ministerial order number 162-A/2015[14]), that meaning the sector is still developing and prospering.

[9] In https://www.omd.pt/content/uploads/2019/09/no2019pt.pdf

[10] Observador, 2016 https://observador.pt/especiais/expo-funeraria-morte-fica-lhes-tao-bem/

[11] Aljazeera, 2021 - https://www.aljazeera.com/features/2021/2/19/portugals-undertakers-struggle-to-cope-with-waves-of-covid-dead)

[12] Expreso, 2017 - https://expresso.pt/sociedade/2017-02-26-O-negocio-da-morte

[13] Público, 2011 - https://www.publico.pt/2011/11/01/jornal/a-vida-numa-funeraria-21798551)

[14] Ministerial order number 162-A/2015 - https://dre.pt/home/-/dre/67374826/details/maximized

In Portugal, the training courses are getting more and more diverse, sophisticated and complete, already existing courses that go up to 100+ hours of training. Tough, the 50-hour training courses are the most common ones. Furthermore, this is still far from what is done in the rest of Europe, as in Spain, where longer 600-hour courses are offered (Maisfutebol, 2015[15]).

3.2. Taxes paid by enterprises and sector under analysis

In general, the Portuguese standard corporate tax is 21%. For Small and Medium-sized enterprises, the corporate income tax is 12.5% on the first EUR 25,000 of taxable income that are located in Portuguese inland regions and 21% on the excess[16]

	2012	2013	2014	2015	2016	2017	2018	2019
Taxes total tax revenue (in % of GDP)	31.8	34.0	34.2	34.4	34.1	34.1	34.8	34.8

Mining Industry

No data available

Food (trade) Industry

No data available

Dental Medicine

In Portugal, all the "provision of medical and health services and the closely related operations carried out by hospitals, clinics, dispensaries and the like" are exempt from VAT (value added taxes, in CIVA, Article 9.º/2).

Funeral Sector

In Portugal, all the services provided by funeral and cremation companies, as well as transfers of ancillary goods to these same services are exempt from VAT (value added taxes) (in CIVA, Article 9.º/26)[17]

3.3. Labor productivity of HR in enterprises by sector under analysis

Years	Industry			
	Total	Agriculture, forestry and fishing	Mining and quarrying	Manufacture of food products, beverages and tobacco products
2012	34,349.87	10,177.76	49,950.50	32,253.68
2013	35,847.50	11,755.53	47,731.55	34,613.65
2014	35,588.57	12,484.45	45,397.21	36,372.69
2015	36,167.52	13,376.65	43,597.13	36,686.10
2016	36,593.31	14,040.74	46,712.56	37,805.19
2017	37,046.60	15,543.09	52,067.92	37,396.61
2018	37,595.21	15,859.59	51,192.84	37,621.93

Apparent labour productivity: total and by industry
Data Sources: INE - Annual National Accounts (Base 2016)
Source: PORDATA
Last updated: 2020-09-25

Source: PORDATA[18]

[15] Maisfutebol, 2015 - https://maisfutebol.iol.pt/sociedade/01-05-2015/de-braco-dado-com-a-morte

[16] https://santandertrade.com/en/portal/establish-overseas/portugal/tax-system

[17] CIVA, Article 9.º/26 in https://info.portaldasfinancas.gov.pt/pt/informacao_fiscal/codigos_tributarios/Cod_download/Documents/CIVA.pdf

[18] In https://qa05.pordata.pt/en/DB/Portugal/Search+Environment/Table

There is a general upward trend in productivity in Portugal, however some industries are starting to show a deceleration in their labour productivity growth[19]

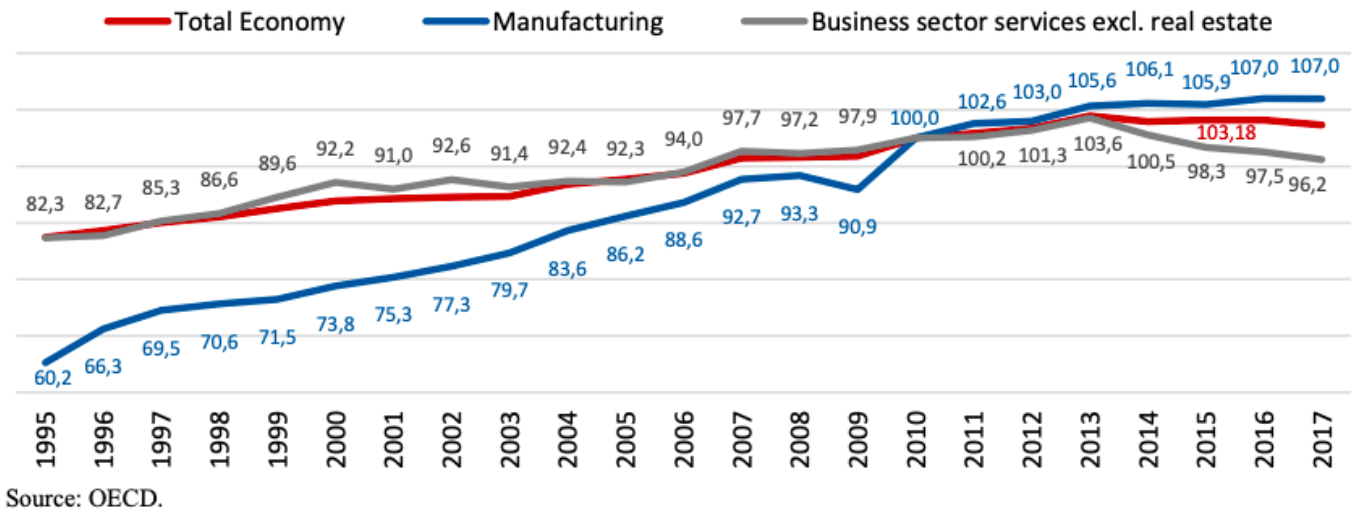


Figure 6- Labour productivity of Portugal (GVA per person employed)

Mining Industry

In Portugal in 2016 the work productivity (Gross Value Added / number of people employed) of the extraction industry (unfortunately there is no data just for the mining subset) was of 23,054 thousand euro as seen on the figure below[20]

This shows an apparent stagnation since the Euro crisis.

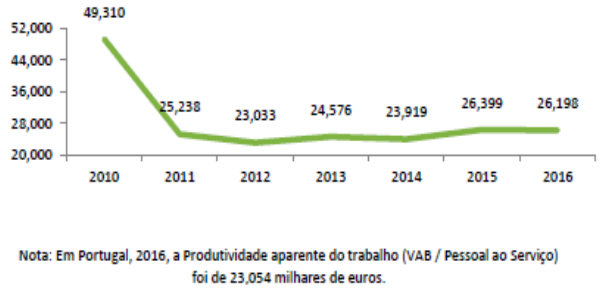


Figure 7- Productivity of the Extraction industry (GVA per person employed) 2010-2016

Food (trade) Industry

According to the latest data collected on the food industry, there still seems to be an upward productivity trend, as seen in the next figure [21]

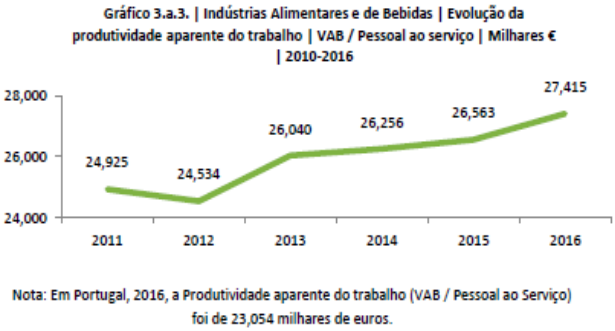


Figure 8- Productivity of the Food industry (GVA per person employed) 2010-2016

Dental Medicine

In 2018, in Portugal, the work productivity of the human health services (since there is no data specifically to the dental medicine sector) was 34 272,16€ as seen on the figure below.

[19] In https://www.gee.gov.pt/en/docs/estudos-e-seminarios/participacao-em-conferencias/2019-3/8565-relatorio-produtividade-en/file

[20] In http://www.dgae.gov.pt/gestao-de-ficheiros-externos-dgae-ano-2017/ficha-tecido-empresarial-industrias-extrativas-pdf.aspx

[21] In https://www.dgae.gov.pt/gestao-de-ficheiros-externos-dgae-ano-2018/ficha-tecido-empresarial-industrias-alimentares-e-de-bebidas-pdf.aspx).

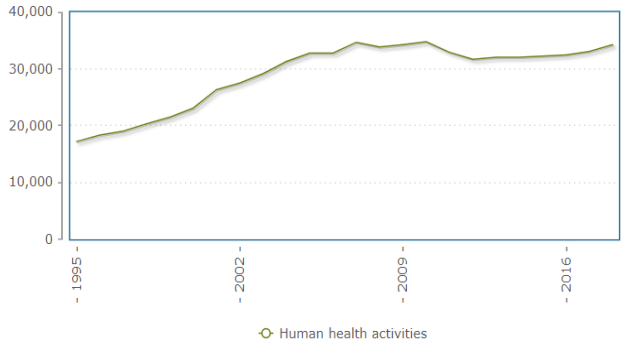


Figure 9- Productivity of the Human Health Activities (GVA per person employed) 1995-2018 Source PORDATA[22]

Funeral Sector

No data available

3.4. Summary of selected Portugal's economic sectors

Mining Industry

The mining industry is a subset of the extraction industry and therefore there is a lack of distinction in some data. Additionally, there would need to be an analysis done by a particular product to get a clear picture of the mining industry as some might be booming in sales and others might be falling which would paint it as being stagnated whilst that isn't necessarily the truth. For instance, it would be relevant to compare mining lithium (where Portugal is starting to emerge as a key player) and mining of materials for the construction industry.

Food (trade) Industry

The food trade industry is a part of the agriculture industry and oftentimes there is no distinction which, just like in the case of the mining industry, makes acquiring data somewhat complicated.

Dental Medicine

The dental medicine sector is a part of the human health services sector, and where there are 11,640 dentists working in the sector and exclusively labouring in the country.
In Portugal, dental medicine is a private sector, meaning that a substantial number of clinics are private companies. The sector has been growing and it is expected to continue growing at an annual rate of 4,3%.

Funeral Sector

The funeral sector in Portugal is still behind, when compared with countries such as Spain or France. And this especially when it comes to training. There are no extensive training programmes in Portugal. The most common are 50 hour-training courses. Despite that (and on a positive note), this industry still has a lot of room to grow, namely in the training area.

4. AidLearn Training Perspectives

4.1. Training portfolio 2015-2025

There is a Catalogue with the permanent training offer, organized by areas of education/training[23], but it should be noted that AidLearn operates predominantly in the context of continuing improvement, being its training activity largely depending on tailor-made plans, designed to meet identified learning needs of its clients, professionals and/or companies.
This implies that there is a great variety in the number of participants, subjects and in the actions implemented throughout the different annual training plans.

Next, will be detailed the AidLearn' s portfolio of training activities 2015-2025 (executed &under execution/forecast), in the selected sectors and in the total.

[22] In PORDATA - Apparent labour productivity: total and by industry)

[23] In https://www.aidlearn.pt/en/formacao/catalogo.html

		Mining Industry Safety and hygiene at the work	Food (trade) Industry Various subjects[24]	Dental Medicine	Funeral Sector Tanatopraxia Tanatoesthetics	Total AidLearn
Executed/ under	2015				30	100
	2016				30	74
	2018					225
	2019					86
	2020					224
	2021	112	96	12		232
Forecast	2022	108	96	24	30	270
	2023		108	72		228
	2024		108	84		240
	2025		108	96		264
						1943

Figure 10- AidLearn' s portfolio of training activities 2015-2021 (provisional/data being updated)

4.2. Most promising and worth hybridizing training

The gather data by the analysis carried out, was sysrtematised in a table (see next page), where some comments are also registered on the feasibility conditions of the hybridization program by AidLearn.

The findings were then presented and discussed by the same participants of the first working meeting (members of the company's expert pool, those responsible for AidLearn training and the management board) to compare the results and take final decisions about the most promising and worth hybridizing training for the company.

it was particularly stressed that the hybridization of training requires scale, which Aidlearn will be able to reach more easily through a wide network in the field of dentistry under construction, which several organisations have expressed their willingness to integrate and constitute themselves as associated partners of HYBVET, as is the case of:

- OP Oral Project Academy- https://www.oralproject.pt/op-academy/
- Real Clinica - http://www.realclinica.pt/
- AsClinica - https://www.facebook.com/as.clinica/
- Order of Dentists Doctors/OMD - https://www.omd.pt/en/
- Postgraduate Center NEON - http://www.neoncursos.com.br/
- Portuguese Society of Temporomandibular Disorders and Orofacial Pain/SPDOF (sleep section) - https://www.spdof.pt/
- European Academy of Dental Sleep Medicine/EADSM - https://eadsm.eu/
- Higher Education institutions in dentistry: https://www.fmd.ulisboa.pt/ | https://www.egasmoniz.com.pt/en-gb.aspx

This, together with the specialists who are already part of the company's expert pool for dentistry and the well-documented need for

[24] Trade and business| Food Products Transformation Processes| Meat Boning and Cutting| Take away Products| Dough Making and Transformation| Fish Processing and Preparation| Meat Preparation|

further training for dentists to expand their skills and strengthen their employability, will allow the company to fulfil its strategic plan which foresees by the end of 2025 to involve around 276 participants in training activities to be offered to the dental medicine sector.

Also decided that the subject to be addressed should be focus on sleep pathology, given the innovation of the topic, its relevance in times of pandemic and the enrichment it would bring to the further training of dentists, in addition to meeting the company's strategic development plan.

Branch/Topic		Employment N	Gross value added Millions Euros % Total (2018)	Labour Productivity /GVA	Training 2022-2025	Observations| Comments
Mining Industry	Safety and hygiene at work	3.010 (2019)	603,41) 0,3%	51.194,82 (2018)	108	Growth trend by lithium supply Continuous experience, but with few learners (real and potential)
Food (trade) Industry	Trade and business Food products transformation processes Meat boning and cutting Take Away products Dough making and Transformation Fish Processing and preparation Meat Preparation	115.600 (2019)	4262,83 2,4%	27,415	420	Although with a large target group and training practice in recent years and forecast, the actions developed are fragmented, non-innovative and covering a wide range of topics, according to the needs Inexistence in the company of the necessary simultaneously mastery in English and subjects' s expertise, towards the hybrid training
Dental medicine (DM)	Sleep pathology in DM: diagnose, treatment and follow-up	11.640 (2020)	630,00 0,35%	34,272 (2018)	276	Annual dentist growth rate of 4.3.% Possible gains of scale in reaching these professionals by collaboration agreements established and to be established in the sector-HYBVET associated partners Opportunity to provide innovative training, not existing yet in the country and meeting the needs of the target audience for differentiation Ease of creating a highly qualified training team, with dentists recognized in the country and highly motivated to experience and develop the hybrid training modality (pool of experts)
Funerals	Tanatopraxia / Tanatoesthetics	5.000	500,00 0,28%	N/A	30	There is some training, but not extensive courses in the country. More than the ordinary training (max. 50 hours of training), there is a need for extensive training, which requires much more resources, including corpses, difficult to access. Few potential learners. Few trainees foreseen in the coming years

Figure 11- Summary table of results, with comments

4.3. HYBVET Curricula to hybrid train dental doctors

Course:

Sleep Pathology in Dental Medicine: Diagnosis, Treatment, and Follow-up

Target Group: Dentists

Entry Profile: The candidate dentists should have an interest in the area of Sleep and on the impact of sleep pathology throughout a person's life.

Exit Profile: At the end of the project, dentists should be able to:

- Diagnose the main sleep disorders, having followed a detailed protocol based on the Clinical Background,
- Perform Clinical Examination,
- Prescribe Complementary exams for the patient's diagnosis and
- Complete the treatment, under a multidisciplinary approach

Training Duration: 16 hours required, under a F2F modality

Background:

General:

The Ordem dos Médicos Dentistas (OMD; Order of Dentists) has 11 640 members, this means there is a dentist per 884 Portuguese citizens. The World Health Organization (WHO) recommends 1 dentist per 2000 citizens.[25]

Last year, the number of dentists rose 3.8%, equivalent to 513 new professionals, in comparison to 2019 in which 750 new members joined the OMD.

These numbers were revealed by the study "Números da Ordem" ("Numbers of the Order") by OMD which reveals the numbers, estimates, and tendencies of the profession.

The number of dentists has been, overall, steadily growing in recent years, despite having slowed down in 2020 to the lowest level in more than a decade. In 2010, there were close to 7,000 dentists registered with the Order, that is, in the last decade (i.e. from 2010 to 2020) there was an increase of over 66%.

Emigration is, unfortunately, the most viable option for younger dentists. It is necessary to alert the younger generations and their families to this reality. In addition to the excess of professionals, a large part of the Portuguese population has difficulty in accessing oral health care due to lack of economic capacity. The dental check program or the pilot project of dentists in health centers only respond to a miniscule part of the population and leave out the vast majority of Portuguese citizens.

There are more and more women practicing dentistry and, last year, the feminization rate of the profession reached 61%. The average age slightly rose and is now 40 years. Close to 90% of those enrolled in the OMD have Portuguese nationality. Of those that do not have a Portuguese Nationality, the most represented are Brazil with 583 dentists working in Portugal, followed by Italy with 242, and Spain with 171[26].

In the geographical distribution of dentists, there is still a large discrepancy between Portuguese regions. The places with fewer dentists with active enrolment per inhabitant are Baixo Alentejo and Alentejo Litoral, with a population/dentist ratio above the recommended 1 dentist per 2000 people.

At the opposite end, the regions with the highest number of dentists per number of inhabitants are the Metropolitan Area of Porto (615), followed by the regions of Viseu Dão-Lafões, Coimbra, Terras de Trás-os-Montes, Cávado and the Lisbon Metropolitan Area, regions that, nevertheless, fall short of the national average ratio.

[25] In https://www.omd.pt/observatorio/numeros/no20-21/

[26] In https://www.omd.pt/content/uploads/2021/05/no20-21pt.pdf

There are 3771 students enrolled in the seven integrated master degrees in dentistry in Portugal and, of these, 1454 (39%) are foreigners. The number of foreign students has been growing steadily and has more than tripled since 2015. Students from France are the most numerous (733), followed by Italians (255), and Spaniards (188).

Emigration also continues to grow among dentists. The number of dentists that suspended their membership in the Order increased last year (95 or 5.7%) to 1770. In total, 12.5% of dentists have their registration suspended. Of these, the vast majority suspended enrollment because they emigrated.

The average age of dentists with suspended enrolment rose to 42 years. However, it should be noted that 55% of suspended members are under 41 years of age. Additionally, France surpassed the United Kingdom as the main work destination for Portuguese dentists. This may be due to Brexit and the insecurity it created for foreign workers and/or those that intended to move there for work purposes.

Meanwhile, new technological advancements are making going to the dentist quicker, easier, less painful and more reliable. Due to these advancements, the dental industry is growing rapidly and looking much different than it did in past years. A greater emphasis on treatment and prevention will mean fewer cavities in patients and less risk of periodontal disease. Similar to innovation within other health care professions, these new technologies will have a huge impact on how dental professionals treat their patients and how people take care of their oral health at home.

For instance, augmented reality technology, which is going to change the world as we know it virtually in every industry, has a huge potential in the dental professions. It has many uses for students and teachers' coursework and on the development of various programs. It is particularly useful for demonstrating techniques on dental models and allowing the students to practice[27] .
These new trends, in which work processes and equipment quickly become obsolete and replaceable, combined with the sharp increase in dentistry, require these professionals to develop new areas of specialization through their continuous professional training. This way, dentist doctors can achieve a greater market differentiation by enriching and updating its repertoire of knowledge and skills, increasing the level of competence and competitiveness.

The sleep area is a new area, not yet taught in dentistry courses, either at the level of initial training or continuous improvement training. In fact, there is still little information about sleep pathology. This was verified through a literature review which corroborated that it is a rarely discussed topic in dentistry and even in medicine in general[28] .

This course aims to enable the General Dentist to be able to screen sleep pathology and, in specific pathologies, collaborate in their treatment and follow-up.

Specific Background:

Sleep pathology has had an important growth at the European level. Obstructive sleep apnea and insomnia are the most prevalent and pose a worrisome public health problem. Depending on the populations analysed, clinical criteria and the articles cited, we have found different numbers of their prevalence in Europe. One of the most cited, Heinzer et al. Swiss series of 2015, found that 34% of men and 17% of

[27] Kwon HB, Park YS, Han JS. Augmented reality in dentistry: a current perspective. Acta Odontol Scand. 2018 Oct;76(7):497-503. doi: 10.1080/00016357.2018.1441437. Epub 2018 Feb 21. PMID: 29465283.

[28] https://www.saudeoral.pt/destaques/sono-qual-o-papel-do-medico-dentista/

women with ages between 30-70 have an obstructive sleep pathology[29] .
This pathology is associated in adults with an increase in cardiovascular disease, metabolic disorders, psychiatric and neurological disorders, among others, and even with a significant reduction in life expectancy[30] .

Among the Portuguese population, a survey found that almost two thirds (60%) say they sleep poorly and many report worrying levels of sleepiness during the day; this number has doubled in the last 12 years[31] .

Experts believe that this growth is more related to an increase in diagnoses than an increase in sleep pathologies. However, they have no doubt that there is a growing medical interest in sleep. Particularly now with covid-19 which has exacerbated sleep issues. In 2019 alone, according to the National Library of Medicine, USA, 16 725 articles were published on sleep, making it one of the most researched areas of biology and medicine.

The competence of dentistry in terms of sleep has been a widely debated topic in recent years, but a study recently accepted by the Archives of Clinical Psychiatry could revive this discussion[32]

OMD is currently looking into the creation of a competence in oral sleep medicine. According to the European specialist, we now know a lot more about sleep in comparison to ten years ago, particularly when it comes to the most prevalent pathologies such as insomnia and obstructive sleep pathology[33] .

The role of dentists in diagnosing and treating sleep disorders should be identical to that of any trained and clinically skilled specialist in the field. But traditionally, although recent in the history of sleep medicine, the image of the dentist has been linked to snoring and sleep apnea, as dentistry is responsible for the manufacturing and placement of mandibular advancement devices [MAD] - a therapeutic modality recognized as effective in the treatment of respiratory disorders associated with obstructive sleep, especially those of mild to moderate severity[34] . However, the currently available training in dentistry schools does not prepare dentists to treat this type of pathologies.

Unfortunately, due to lack of training and criteria, dentists often end up performing technical work with important clinical limitations, particularly when it comes to sleep disorders as there isn't a comprehensive treatment guide. If you come with a history of snoring and if you have a positive sleep study for apnea, if you are referred for MAD therapy, the dentist evaluates from the point of view of the stomatognathic system, assigns from this perspective and, eventually, makes molds and conducts the process that ends with the proper placement and titration of the device.

It is common, however, that aspects such as sleepiness and other residual symptoms

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[29] Heinzer R, Vat S, Marques-Vidal P, Marti-Soler H, Andries D, Tobback N, Mooser V, Preisig M, Malhotra A, Waeber G, Vollenweider P, Tafti M, Haba-Rubio J. Prevalence of sleep-disordered breathing in the general population: the HypnoLaus study. *Lancet Respir Med.* 2015 Apr;3(4):310-8. doi: 10.1016/S2213-2600(15)00043-0. Epub 2015 Feb 12. PMID: 25682233; PMCID: PMC4404207.

[30] Institute of Medicine (US) Committee on Sleep Medicine and Research; Colten HR, Altevogt BM, editors. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. Washington (DC): National Academies Press (US); 2006. 3, Extent and Health Consequences of Chronic Sleep Loss and Sleep Disorders. Available from: https://www.ncbi.nlm.nih.gov/books/NBK19961/

[31] https://expresso.pt/sociedade/2016-11-23-Quase-dois-tercos-dos-portugueses-dormem-mal

[32] https://www.saudeoral.pt/destaques/sono-qual-o-papel-do-medico-dentista/

[33] https://www.omd.pt/content/uploads/2020/03/proposta-regulamento-competencias-setoriais.pdf

[34] Marklund M, Stenlund H, Franklin KA. Mandibular advancement devices in 630 men and women with obstructive sleep apnea and snoring. *Chest.* 2004;125:1270–1278.

remain even after the response confirmed by the sleep study. These, together with some comorbidities that so often run silently in the context of respiratory disease and that increase the risk of general illness and death from any cause, should be better addressed and followed than they usually are, however, this can only happen if there is cause for suspicion and the necessary knowledge to treat or refer the patient. Thus, training dentists to address these issues is paramount.

It is unthinkable to consider the treatment of any sleep disorder and, in particular, sleep obstructive breathing disorders without a multidisciplinary approach and without including dentistry. In a study by Vuorjoki-Ranta et al. (2016), the authors recognized that although the knowledge of general dentistry practitioners has been increasing (42% in 2004; 88% in 2016), they were unable to recognize certain characteristic signs and symptoms of OSAS (obstructive sleep apnea syndrome)[35] . Another study observed that 54% of dentists, despite considering it relevant to refer patients when they suspected OSAS, had never done so[36]. This lack of knowledge on this topic suggests a need to reinforce the academic training of dentists on it.

The approach must be multidisciplinary, but all professionals involved must have knowledge of the essentials of sleep medicine. Dentists are essential. In many cases, they may be the first to consider the diagnosis of SAS [sleep apnea syndrome] in patient observation.
The dentist is assuming an increasingly important role in the multidisciplinary medical treatment of sleep pathology, being at the forefront of the approach, clinical diagnosis and treatment of sleep obstructive respiratory disorders, both in adults and in children. Indeed, it is unthinkable to consider the treatment of any sleep pathology and in particular of sleep obstructive respiratory disorders, such as snoring, apneas, hypopneas and Upper Respiratory Resistance Syndrome (UARS), as well as sleep bruxism, without considering a multidisciplinary approach, however, there is also a lack of training and patient awareness in regards to dentists' skills[37] .

When it comes to bruxism, a disorder characterized by involuntary clenching and grinding of teeth, it is estimated that the prevalence is 20% in adults and that in Portugal about 100,000 people are affected by this condition. This condition corresponds to a sleep pathology in the area of movement that has dentists as one of the main health agents capable of identifying it[38]

The general population is profoundly unaware of dentists' real medical capabilities and this becomes even more evident in a level as differentiated as in sleep dentistry. It is estimated that about half of men and a quarter of women have or will have SAS in their lifetime, a pathology associated with cardiac and cerebrovascular diseases and which manifests itself through excessive daytime sleepiness, conditioning professional performance, and with a high impact on mortality[39].

The prevalence of SAS varies depending on the method used. An Icelandic study, conducted by Arnardottir et al. found that 19% of the participants had moderate to severe SAS based on a cardiorespiratory study of home

[35] Vuorjoki-Ranta TR, Lobbezoo F, Vehkalahti M, Tuomilehto H, Ahlberg J. Treatment of obstructive sleep apnea patients in community dental care: knowledge and attitudes among general dental practitioners and specialist dentists. *J Oral Rehabil*. 2016;43(12):937–42.

[36] Bian H. Knowledge, opinions, and clinical experience of general practice dentists toward obstructive sleep apnea and oral appliances. *Sleep Breath.* 2004;8(2):85–90.

[37] https://www.saudeoral.pt/destaques/sono-qual-o-papel-do-medico-dentista/

[38] https://www.cuf.pt/saude-a-z/bruxismo

[39] https://www.saudeoral.pt/destaques/sono-qual-o-papel-do-medico-dentista/

sleep[40] The study by Heinzer et al., from 2015, with polysomnography (PSG), revealed that about half of men and a quarter of women had the disease with this degree of severity[41] . This divergence in numbers is due to the fact that in PSG micro-awakenings play a decisive role, and, in our opinion, an excessive one, in the classification of obstructive events. We also think that the current definition needs to be revised, as it only takes five events per hour and a vague symptom, such as fatigue, to be labelled SAS. If we go here, 79% of the population will have SAS, which is manifestly surrealistic, and would influence therapeutic orientation and lead to an over prescription of continuous positive airway pressure (CPAP). CPAP plays a fundamental role in the control of severe forms of disease, and/or when there are severe cardiovascular or metabolic comorbidities, and/or when daytime sleepiness is marked. Its use cannot, however, be trivialized, especially since in mild and asymptomatic forms the adhesion is very low. Mandibular advancement devices (MAD) have been suggested as an alternative to CPAP in non-adherent patients. And they can be, but we consider that, above all, they are first-line treatments in mild and moderate SAS without comorbidities. They are more comfortable and less expensive, but, unfortunately still not subject to reimbursement by the Portuguese SNS, despite the fact that that is already being done in some other European countries.

Despite Professor Cristhian Guilleminault and his research group, from Stanford University warning us in 1981 about the clinical manifestations of pediatric OSAHS [obstructive sleep apnea and hypopnea syndrome], how they are distinct from that of adults, and even classifying the disease[42] , we can still say that we are facing a very recent area of medical differentiation in the history of medicine and dentistry.

The training of health professionals from different areas, the creation of professional skills for their treatment is crucial at this stage of the training of health professionals.

Training Structure[43]: Two days split in 5 sections, totalizing 16 hours.

Program:

Day 1

Section I – Introduction to Sleep Medicine

- The Nature and Functions of Sleep;
- Sleep Neurobiology and Neurophysiology;
- Classification of Sleep Disorders.

Practical Demonstrations | Case study

Section II – Patient Evaluation

- Interviewing and assessing the patient;
- Differential diagnosis;
- The multidisciplinary organization of Centro do Sono (Sleep Centre): Neurology, Pulmonology, Psychiatry, Psychology, Chronobiology, Physiotherapy, Speech Therapy, Maxillofacial surgery, Physical exercise, Nutrition;

Diagnostic exams and tests: Polysomnography and Polycardiography - introduction to the devices;

Practical Demonstration | Clinical Cases.

Section III – Sleep Disorders

- Relationship between Sleep and Respiratory Disorders;
- Pathophysiology of Obstructive Sleep Apnea;
- Long-term consequences of Obstructive Sleep Apnea;

[40] Arnardottir ES, Bjornsdottir E, Olafsdottir KA, Benediktsdottir B, Gislason T. Obstructive sleep apnoea in the general population: highly prevalent but minimal symptoms. *Eur Respir J.* 2016 Jan;47(1):194-202. doi: 10.1183/13993003.01148-2015. Epub 2015 Nov 5. PMID: 26541533.

[41] Heinzer R, Vat S, Marques-Vidal P, Marti-Soler H, Andries D, Tobback N, Mooser V, Preisig M, Malhotra A, Waeber G, Vollenweider P, Tafti M, Haba-Rubio J. Prevalence of sleep-disordered breathing in the general population: the HypnoLaus study. *Lancet Respir Med.* 2015 Apr;3(4):310-8. doi: 10.1016/S2213-2600(15)00043-0. Epub 2015 Feb 12. PMID: 25682233; PMCID: PMC4404207.

[42] Guilleminault C, Korobkin R, Winkle R: A review of 50 children with obstructive sleep apnea syndrome. *Lung* 1981;159: 275–287

[43]Values of the face-to-face training in reference, which will have to be readjusted to the reality of the hybridized course

- Clinical Approach to the Diagnosis of Obstructive Sleep Apnea;
- Upper Airway Imaging in Obstructive Sleep Apnea;
- Obstructive Sleep Apnea Treatment Overview.

Practical Demonstration | Clinical Cases

Day 2

Section IV – Nocturnal Bruxism and Movement Disorders

- Definitions, Epidemiology and Etiology of Night Bruxism;
- Orofacial Movement Disorders During Sleep;
- Clinical Approach to the Diagnosis of Night Bruxism;
- Pathophysiology of Night Bruxism;
- Night Bruxism in Children.
- Interceptive orthodontics and OSAHS in children;
- Controlling Night Bruxism;
- Comorbidities.

Clinical Cases

Section V – Oral Devices

- Oral Devices: BTI Apnea System;
- Oral Devices: types, manufacturing techniques, protocols;
- Guidelines for making oral devices;
- Dentofacial Orthopedics in the treatment of Apnea and Snoring: Clinical Cases;
- Physiotherapy in patients with Snoring and Obstructive Sleep Apnea;
- Physiotherapeutic intervention in the preparation of the candidate patient for oral devices and CPAP;
- Adverse Reactions of Oral Devices: T Dysfunctions.

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Gabriela Videira	Graduate in Dentistry,1999, Instituto Superior de Ciências da Saúde Egas Moniz, Portugal Degree in Dentistry Advanced Studies,2003, Complutense University of Madrid, Spain Specialist in Periodontology, Ordem dos Médicos Dentistas International Post-Graduation in Temporomandibular Disorders and Orofacial Pain, Faculdade de Sete Lagoas, Brazil Professor at Msc “Trastornos del Sueño para Médicos y Odontólogos” at UPV/EHU, Spain Professor at International Post-Graduation in Temporomandibular Disorders and Orofacial Pain, Faculdade de Sete Lagoas, Brazil Professor at Post-Graduate Program in Sleep Psychology - B-learning, Universidade Católica Portuguesa, Lisbon, Portugal Coordinator of Dentistry department in LUZ Saúde, Cluster Sul since 2019 Coordinator of Sleep Section of SPDOF (Sociedade Portuguesa de Disfunção Temporomandibular e Dor Orofacial) Member of EADSM (European Academy of Dental Sleep Medicine) Member of the AidLearn Pool of Experts to the field of Dental Seep Medicine

Cátia Reis	PhD in Environmental Health (Faculty of Medicine),University of Lisbon); MSc in Human Biology and Environment (17/20) (Faculty of Sciences, University of Lisbon); Environmental Biology (13/20) degree (Faculty of Sciences, University of Lisbon); Travel Medicine Course (18/20) (Institute of Hygiene and Tropical Medicine, Lisbon); EASA Advanced Aviation Medicine Course (v.1.3) King's College London; Sleep and Chronobiology Summer School (Sleep and Circadian Neuroscience Institute (SCNi), University of Oxford); International School of Human Chronobiology and Working Life (Stockholm Stress Institute, University of Stockholm), ESRS Sleep Science School 2019, "Sleep and ageing" (European Sleep Research Society, Frejus, France).
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Education and Training Area:

724.01. Dental Medicine

5. Description of the results of the round table discussion

As previously mentioned, specialists from the company's expert pool were involved in this study from the very beginning, having assisted to delimit the sectors to be studied as well as to deepen knowledge about the selected sector - medicine dentistry and the specific topic to work on in hybridization -sleep pathology in dental medicine.

On the other hand, given that the company has been working to create a wide network in the field of dentistry, in order to facilitate the fulfilment of its strategic plan, we can already count on a significant number of organisations that have expressed interest in becoming associated partner of the HYBVET project.

Therefore, it was decided that a round table with the interested stakeholders (associated partners and others) will be held later, when we have a first outline of the course, its methodology, thematic content, duration, etc. in order to validate it and collect suggestions for improvement and reinforce their interest in the future appropriation of the results.

Conclusions

The study was carried out following 5 steps:
1. Identification of the training areas to apply hybrid-simulation training method by a working meeting 1 with members of the company's expert pool, responsible for AidLearn training; HYBVET team and the management board
2. Description and impact of the 4 selected areas:
Safety and hygiene at work (mining industry) | Food (trade) Industry | Funeral Sector! Dental Medicine
3. AidLearn Training Perspectives
Training Portfolio 2015 -2025
4. Decision on the most promising and worth hybridizing training
Working meeting 2 to compare the results and take final decisions about the most promising and worth hybridizing training for the company.
Curriculum design to hybrid training | Trainers (4) selected
5. Round table discussion with stakeholders (associated partners)
In preparation, with a set of stakeholders already identified. To be carried out as soon as a first draft version of the course is established.
Validation of the curriculum and establishment of an informal network of stakeholders in Portugal, expecting their support in the pilot test phase, in the promotion activities and later appropriation of the project results.
This way, preparing the future sustainability of HYBVET project and its products.