

Special Issue

SPECIAL ISSUE

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PREFACE

This book is the 9th volume (a special issue) of the research book series *Emerging Issues in Research on Vocational Education & Training*, an outcome of the scientific work and networking of the research group VETYL (*Vocational Education & Training/Yrkeskunnande och Lärande*), at the Department of Education, Stockholm University, Sweden. This research group was created in 2011 with twofold aims: contributing to the advancement of knowledge in the intricate area of vocational education and training (VET) and strengthening the research bases of the teacher education program for VET that is offered at the Department of Education, Stockholm University. The Swedish term “yrkeskunnande och lärande” in the name of the research group translate as “vocational knowing” and indicates one of the major research concerns of the group.

Earlier volumes were the outcome of the international conferences organised yearly by the research group following the modality of invited papers. The conference has had two core aims: becoming a forum for sharing state of the art research in the VET field and a forum for networking and cooperation. The Stockholm International Conference in VET has now a well gained place within the major academic events organised in Europe as part of the European Network for Vocational Education and Training (VETNET). The academic tradition initiated by this conference continues.

The texts presented in this volume are representative of the research work done by members of the research group VETYL and our international network. Colleagues from partner institutions internationally as well members of other research group at

the Department of Education contribute as co-authors or with own text in this volume. Since 2023 this research book series became *Palgrave Studies in Technology and Vocational Education and Training*, a publication that intends to continue our tradition to publish state of the art high quality research in the field. However, the current volume was already planned to be published within the previous series *Emergent Issues in Research on Vocational Education & Training*.

The Research Group Vocational Education & Training/Yrkeskunnande och lärande (VETYL) is committed to contribute to the development of the research field Vocational Education & Training as well as the scientific grounds of the teacher training program for vocational subjects at Stockholm University. Likewise, the group is committed to cooperating with institutions for vocational education and training of youth and adults in Sweden and internationally.

Important ground of the work of the group is an acknowledge of a history of vocational education and training that in Swedish context dates to the 19th century and is today an intricate and complex area with a distinct research identity. Common in the diversity of research backgrounds at theoretical positioning is an acknowledgment of the complexities of research in the field as highlighted by Felix Rauner and Rupert Maclean (2008, p. 13) in the following terms:

The variety of research questions and development tasks at the levels of vocational education and training systems (macro level), the organization and design of vocational training programs and institutions (meso level) and the analysis and shaping of education and learning processes (micro level) leads to

the integration of different scientific disciplines and research traditions. VET research therefore can be organized only in an interdisciplinary way.

Summarising, this volume illustrates well the diversity of research in the field in a way that is not frequently available in the literature today. We hope that the book will fulfil the expectations of a variety of readers including under-graduate students, in particular students in initial and in-service teacher training programs for VET, post-graduate students, and policy makers.

Our gratitude goes to all the authors for enthusiastic support to our fruitful academic discussions, the strengthening of our institutional networking and the commitment to the advancement of knowledge in the field.

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Marianne Teräs,

Petros Gougoulakis

& Janne Kontio

Stockholm, December 2023

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Teacher education with a focus on humanistic and social value formation – A case study of humanistic training in university students

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ABSTRACT

Social value and humanistic training in university students is a necessity in the face of the challenges imposed by current times in order to achieve a more just and inclusive society. The objective of this article is to characterise the initial state of humanistic training in students taking the bachelor's degree in teacher education at the University of Pinar del Río "Hermanos Saíz Montes de Oca" in Cuba. This is a qualitative study in which empirical methods such as documentary analysis, observation, interview, survey and methodological triangulation were used. To verify the initial state of the problem raised, the humanistic training process of the students of the bachelor's degree programme of teacher education was assumed as a variable and the humanistic training process was investigated as specific dimension. Although in the different earlier study plans the transversal nature of humanistic training and its impact on the different processes that occur in it are appreciated, this study concludes

that there are insufficiencies in the humanistic training process in students. It also concludes that there are shortages to be addressed both concerning the academic, the school-based and the research dimensions of the program.

KEYWORDS

Humanistic training; initial training; student

INTRODUCTION

It is a challenge for universities today to provide responses to social demands in a globalised society where scientific and technological advances are embraced, and which requires the training of qualified professionals to face present social challenges. Hence, it is essential to create a curriculum which among other things will aim to train future teaching staff using a humanistic approach. In this context, the Educational Goals for the year 2021, adopted in Dakar, are taken as a reference point. These include a general goal to strengthen the teaching profession and specific goals to raise the quality of the initial training of teachers. These goals are included in the 2030 Agenda, which guarantees inclusive, equitable and quality education and promotes lifelong learning opportunities for all (Betto, 2014).

In Cuba, the training of a competent teacher aware of the social mission of the profession in current times is essential. In accordance with the perspectives of the third Improvement of the National Education System (SNE), there is a need to improve the quality of the teaching-educational process and to strengthen

the role of the teacher. For this reason, teacher training with a humanistic approach constitutes a requirement of the social project included in the so called “E” study plan. The general objectives of this plan emphasise the need for teacher students to be able to show a system of knowledge and values through their performance in the school-based education (MES, 2016).

When referring to the role of the educator in society, Betto (2014) states that the educator must form dignified, participating human beings with critical awareness. He must develop values of solidarity, altruism, selfless support for just causes, among others. In this sense, humanism becomes an essential component of the comprehensive training of primary education professionals, being the main ones in charge of training current and future generations under this concept.

The students of the bachelor’s degree in education are expected, upon completion of their studies, to contribute to the development of the holistic personality of the school students. There are frequent claims by teacher training staff members that the humanistic training and value formation of the students taking the bachelor’s degree in primary education at the University of Pinar del Río in Cuba, in the current context does not reach the desired level, since the students express deficiencies in terms of, for example, knowledge about the paradigms of humanism and even patterns of behaviour.

There are several authors who have approached the concept of humanistic training in different ways, from different points of view. Such are the cases of, Mendoza (2005) y Chacón (2006), they analyze it through an ethical and/or axiological approach, Ortiz (2016) and Camacho (2018) propose assuming a critical and emancipatory humanism and Lastres (2020) establishes the

interrelationships between the professional problems of education and the historical-contextual conditions.

The authors mentioned above, from their perspectives, offer valuable elements for the study being carried out. In general, they agree that the appropriation of comprehensive knowledge about the nature of humans and society, channelled to the cultivation of spiritualism and sensitivity to the problems of human beings, is essential as a principle in a humanistic education particularly in the Cuban context.

In relation to the conceptualising of humanist education and value formation, Noel (1986) and Hernández (2013) agree that it is to be understood as the set of questions and issues associated with the specifically human way of existence, as well as the type of society and environment in which individuals can realise themselves in correspondence with their essential nature and the interaction with in the context. Briefly, the definition addresses what is related to the essential nature of the human being, as well as the social relationships and the context in which they operate. However, what concerns the transformation of the world based on human knowledge and its concern for the well-being of humanity is not clearly explained, although it refers very briefly to the individual behaviour and conduct in society.

The analysis carried out so far allows us to elucidate that humanism goes beyond the boundaries of knowledge about human beings, it crosses the limits of sensitivity and concern for what is human. It goes beyond the study of humanistic sciences and the understanding of the behaviour of humanity. It is a form, a way of being and doing of the human being, in which he acquires a more comprehensive vision of himself and his world, to self-recognise and project himself into it, based on material and spiritual well-being, both individually and collectively.

The study of these elements allows humanistic training to be highlighted as one of the most relevant social demands on higher education.

To carry out the study of the different stages through which humanism goes, it is important to consider that each of these stages is characterised by maintaining a conception and an approach to the reality of the human being, according to the different particularities of the historical times in question. It is considered, therefore, that the humanistic training process goes through stages in which the student appropriates superior qualities in his preparation in terms of knowledge, skills and values that correspond to the professional model to be achieved. Ramos (2000) points out that when speaking in general of humanistic training of the university professional, differentiating it from that through the means of the social environment, the experiences of the subject and his/her social relationships. There is partial agreement with these criteria, since the aforementioned author recognises the curricular and extracurricular routes as essential for humanistic training in the university environment.

Concerning the humanistic training at the university, Esquivel (2004) points out that: "Traditional humanism is no longer enough (...). Another humanism is necessary that incorporates new elements into our culture. A new humanism is required, an integral humanism" (p.3).

This analysis is interesting because, from another sociocultural reality, Esquivel (2004) addresses the urgency of changing the methods in this process, since the results are not in accordance with social demand. His study also highlights the need to incorporate the original culture to achieve the expected goal, as a new vision is currently needed, which includes the best of

universal culture, but at the same time integrates the distinctive elements of the context in which it takes place.

Following a similar line of argumentation, Añorga (2004) refers to the objectivity with which, in the current living conditions, humanistic training must be valued, highlighting the function that knowledge plays in interaction with the ability to transform the environment: (...) there is a need to rescue love and humanism, which, as an essence, differentiates us from the other members of the animal kingdom. But love and humanism, without knowledge and skills, cannot transform the environment and guarantee that the basic needs of humans are met (p. 11).

Humanistic training must be understood not only in terms of knowledge related to the history of humanity, the process of universal and national culture, the concepts and categories that allow the appreciation of artistic-literary manifestations. Mendoza (2005) insists on humanistic training, which from its theoretical-practical essentiality, is understood as: (...) the formation in students of a system of knowledge, skills, feelings, values, convictions, which is based on a dialectical-materialist methodology and a cultural and personological approach, aimed at the comprehensiveness of knowledge, the cultivation of sensitivity and spirituality, the interpretation and explanation of historical, social and cultural processes, as well as the development of a style of thinking and acting based on the transformation of reality. Humanism training is based on the comprehensive knowledge of the human and the world in which he/she lives, on the understanding of the meaning of human life and the multifaceted nature of its realisation. For this reason, it is expressed, above all, in a cultural conception and in an axiological approach (p.11).

The analysis of the definition of humanistic training allows us to delimit “the individual and his human fulfilment” as a central idea, which is why it is stated that humanism constitutes the content of humanistic training. Consequently it is essential to analyse the relationship between both and the evolution of the first in the course of human history. What has been stated up to this point reaffirms the need to reinforce the humanistic component in the initial training of the education professional, understanding this process, according to Chacón (2006), as a set of knowledge, professional skills, ideological values inherent to the profession, work methods and procedures, that allow the student to develop ways of relating and acting with a humanistic sense (esteem and consideration of human beings, love of human beings, love for the profession), which guides their transformative and educational activity (p.9).

The analysis of these criteria allows us to define the humanistic training in students taking the bachelor’s degree in primary education as the systematic transformation that aims to prepare students for the bachelor’s degree in primary education with a style of humanistic thinking and acting; that contains respect, consideration, love and sensitivity towards society, the human being and the profession; integrating the instructive, educational and developmental into dialectical unity; that allows the appropriation of a system of knowledge, professional skills, values inherent to the profession, work methods and procedures; conceived from the scientific direction of the components of professional training and oriented towards social commitment (Arencibia, 2021, p.8).

The use of the potential of the context in which the students of the bachelor’s degree in education live and are trained as edu-

cational professionals is not sufficiently treated by pedagogy when explaining the training. Therefore, the treatment of the deficiencies in the relationship between humanistic training—modes of professional action—and the teaching professional identity constitutes the epistemological gap of the research.

In an exploratory study developed in the 2019-2020 school year, on the state of humanistic training in the bachelor's degree in education, documentary analysis, observation of curricular and extracurricular activities, interviews with teachers and a survey of students were carried out. Together with the experience of more than 20 years of teaching in this field, the following limitations are revealed: the students present insufficient knowledge of the essential features of humanism. Sometimes they prioritise individual interests over the interests of the group and do not always respectfully consider other people's opinions as they do not coincide with their own. They have limitations in their ability to make critical judgements, reflect, identify problems and transform educational reality. They show little perseverance and sense of belonging, and the expectations, goals and professional life projects of some students are reduced to the level of economic and family independence.

These results indicates that the humanistic training of the students has insufficiencies because it is not implemented in a systemic, comprehensive and contextualised to the solution of professional problems. This in turn has a negative impact on the mode of action and formation of the teaching professional identity. Therefore, a contradiction is revealed between the reality that exists in the humanistic training of the students for a career that does not correspond to the demands of the professional model, and the need to achieve a humanistic training that

prepares them to efficiently assume the social mission expected from teachers.

METHODOLOGY

Grounded theory as proposed by Hernández et al. (2014) to integrate quantitative and qualitative information was used during the verification of the problem. Triangulation was used in its methodological variant, according to Ruíz (1999). The methods used at the theoretical, empirical and statistical levels are assumed from Pérez et al. (1996), Ruíz (1999) and Hernández, Fernández and Baptista (2014).

The population consist of 40 students of the bachelor's degree in education (10 are in the third year, 15 in the fourth year and 15 in the fifth year). The enrolment represents 100% of the total cohort for the 2019/2020 school year. These students have already acquired the basic knowledge of general and specific training for the planning of their work as teachers. They are also developing the systematic and concentrated work component in the teaching units where they carry out planning, execution and control actions of curricular and extracurricular activities, in correspondence with the professional pedagogical mode of action.

The 35 teacher trainers of the career group have systematically interacted with these students. They all have the academic title of Master in Educational Sciences. They have more than five years of professional experience teaching the subjects in the degree. Of the total, 20 teachers have professional experience in primary education. To verify the initial state of the problem raised, the instructive, educational and developmental dimen-

sions are determined, which correspond to those designed by Horruitiner (2008). A fourth dimension: the direction of the humanistic training process, is established from the need to diagnose the development of the direction of this process as part of the initial training. For the parameterisation of the indicators established in correspondence with each dimension, the categories Very Adequate, Fairly Adequate, Adequate, Just Adequate and Not Adequate were used.

To determine the initial state, the information obtained from the document analysis, the observation guide, the student survey and the teacher interview was processed and a methodological triangulation was carried out. It began with document analysis, which made it possible to characterise the current conception of humanistic training through the study of normative documents and other documentary sources. To this end, the standards established by the governing and methodological documents of the degree were taken into account, such as: the professional model of the graduate in primary education, study plan “E”; methodological guidelines of the degree in education of Plan E; programmes of disciplines and subjects; programmes of the main integrating discipline; educational strategies of the career and academic years; and minutes of the career groups and academic years.

An observation guide was used to determine the main difficulties that humanistic training presents for students of the bachelor’s degree in primary education, during academic, work, research and extension activities. Thirty activities were observed: eight classes; six university extension activities; five work practice activities; three brigade meetings, four academic year groups and four career groups. Next, a survey was adminis-

tered to the 40 students to verify their state of opinion regarding the level of satisfaction in relation to the training received to achieve humanistic training. The interview was carried out with the 35 teacher trainers

with the purpose of finding out their opinions about the humanistic training and the preparation they have to carry out this training. Finally, methodological triangulation was carried out. Using this technique, the points of coincidence and discrepancies in the information obtained through the applied instruments were determined.

RESULTS AND DISCUSSION

When carrying out an evaluation of the initial state of humanistic training of the students of the bachelor's degree in education at the University of Pinar del Río "Hermanos Saíz Montes de Oca" in Cuba, it was found that the document analysis carried out based on the guide developed allowed the following aspects to be identified:

- The structural components of the professional model allow us to implicitly appreciate essential elements that distinguish each academic year related to the humanistic training of students.
- Professional problems related to humanistic training. It is explicitly recognised that the direction of the educational process, in general, and the teaching-learning process in particular, must have a scientific-humanist approach.
- The didactic structure of the academic, work, research and extension components responds to the demands of society and a professional in education.

- All the disciplines that make up the study plan contribute to the growing development of the students of the programme from a humanistic perspective.
- The integrative nature of the discipline is recognised, intra- and interdisciplinary relationships are projected, through the substantive processes of higher education. By updating with the introduction of scientific research results and the development of investigative skills in teachers in training, integration is enabled.
- The comprehensive training of students is explained from the conception of the curriculum, which guarantees the training of a competent professional, with ethical, social and environmental responsibility.
- Humanism and professional identity are among the fundamental values of the career to which the disciplines and subjects are contributing.
- The subject programmes do not explain how to contribute to the humanistic training process to achieve a comprehensive general culture in students.
- The actions conceived from the curricular activities that appear in the educational strategies of the degree and the academic years do not always achieve the active and conscious participation of the students.
- Although the activities respond to the integral development of the students, student engagement is not always encouraged in the preparation and execution of the activities.

From the analysis of the aspects of the observation guide it was possible to verify:

- Insufficiencies in comprehensive knowledge about the nature of the human being and society, which are visible in the form of limited mastery of a universal and national culture that allows the appreciation of artistic, literary, social and economic manifestations.
- The development of skills that promote professional performance and the application of work methods and procedures that contribute to the interpretation and assessment of the context is limited.
- Students do not always express themselves with respect and concern for the good of others and do not act with total consideration, sensitivity and esteem for their colleagues.
- They show deficiencies in the planning of actions that contribute to solving professional problems using professional pedagogical skills.
- There is insufficient connection between the activities carried out in work practice and student scientific work.
- Teachers sometimes do not use properly the potential offered in the initial training stage of students based on humanistic training.

The analysis of the survey states that:

- Knowledge gaps are evident in relation to values.
- Students consider having the knowledge and skills that promote the development of modes of action consistent with the profession.
- The level reached of the development of activities linking

academic training, practice-based education and other cultural activities organised in campus is rather limited.

The analysis carried out on the interviews with the teacher trainers made it possible to arrive at the following conclusions:

- Students consider that the contents of the subjects and other activities offer possibilities for the comprehensive training of the students.
- The possibilities of the subjects are not intentionally taken advantage of to favour the humanistic training process of the students.
- The value of subjects that promote knowledge, and values of professional performance are recognised, but the development of modes of action consistent with what is established in the professional model is not always appreciated by the students.
- Students do not always consider with respect the criteria of others as they do not coincide with their own, and they show a lack of sensitivity and courtesy towards their classmates.
- Students sometimes value their classmates for what they have and not for what they are, hurting their dignity.
- There are insufficiencies in the direction of the process, since the planning, organisation, execution and control of activities in a creative and intentional way for humanistic training is not achieved.

The methodological triangulation carried out allowed us to determine the points of coincidence and discrepancies in the information obtained.

The students agreed regarding:

- The lack of basic knowledge and application of work methods and procedures that influence the development of skills for professional performance.
- Limitations of the level reached for the development of activities in which the link between academic, research and school practice is established.
- Insufficiencies in the planning of actions that contribute to solving professional problems using professional pedagogical skills.

The teacher trainers state that:

- The possibilities offered by the subjects are not always intentionally taken advantage of in the conception and planning of activities to promote humanistic training.
- Actions conceived from the curricular and extracurricular do not always achieve the active, and conscious participation of students.
- There are insufficiencies in the direction of the process, since the planning, organisation, execution and control of activities in a creative and intentional way for humanistic training is not achieved.

Aspects presented above are evident in the following regularities uncovered in our research:

- The students consider they have the knowledge and skills to promote the development of modes of action consistent with the profession, however, the teacher trainers state in the interviews that the development of modes of action consistent with what is established in the study is not

- always appreciated in the students' Professional Model.
- Students do not promote the development of feelings and esteem towards their peers, nor respectfully consider the criteria of others.
 - The humanistic training process lacks a systemic, comprehensive and contextualised character.

The findings of this study indicate that the humanistic training of the students taking the bachelor's degree in education at the UPR shows insufficiencies because it is not carried out in a systemic, comprehensive and contextualised way to solve professional problems. The becoming teachers consider having the knowledge and skills that promote the development of modes of action consistent with the profession. However, teacher trainees state that students do not always see the development of modes of action consistent with what is established. This seems related to the fact that the humanistic training process lacks a systemic, comprehensive and contextualised character.

The above significantly influences the establishment of social relationships, which in turn, and as a consequence of the above, does not allow students to develop feelings and esteem towards their peers, nor to consider with respect the criteria of others. The base document for the design of the "E" Study Plans states in its conceptual basis the strengthening of humanistic training in all, careers and for this:

It is necessary to qualitatively enhance, from the curricular perspective, the teaching of disciplines that, by their nature, have man and his social relationships as their centre of attention; and furthermore, that in the rest of the disciplines a

humanistic social output is appreciated in accordance with the professional profile, trying to ensure that the contents are nourished with elements of a philosophical, socioeconomic, political and cultural nature, which enable a teaching-learning process that offers students the necessary preparation to understand and transform the society in which they live with high responsibility in their actions and solid convictions (Plan E, 2016, p.13).

The levels of transformation, directed by the teacher in an intentional and systematic manner, must begin with an internal analysis encouraging a critical examination that promotes the need for change. This presupposes that the humanistic training of the students taking the bachelor's degree in primary education at the UPR shows insufficiencies, so it is necessary that the contents intentionally allow reflective reasoning where the common thread is the qualities that humanise the student, since no one can offer what the Director Programme for Education in the Value System of the Cuban Revolution does not have. It specifies humanism as: consideration, sensitivity and esteem of the human being as the highest values of society (Mined, 2012, p.6).

Another action that can be carried out is the "Meeting of three generations of teachers." To do this, the Career Collective must search for teachers who represent the subjects in which the students are trained. The presence of retired teachers is suggested, as well as others from the "Manuel Ascunce Domenech" pedagogical detachment and others with more recent training, if possible, with experience in teacher training. The invitation of family members and members of the community in which the university is located is permitted.

In the activity, a dialogue is developed in which the experiences of the three generations of educators are revealed, their motivations, the characteristics of the subjects during the different stages, the role that the teacher has played in society over the years, how they identified with this profession, and whether humanistic training is intended within their profile as a teacher, among other aspects that are of interest to students as the main interviewers. So that a true exchange of experiences takes place and, based on the real experiences told, they become aware of what it means to be a teacher with a humanistic training in correspondence with the demands of today's society.

In the exchange, it would be good for each of the interviewees to express the motive that led them to select the profession and to state what have been the essential attributes that have accompanied them in their work as a teacher, highlighting the qualities that they must possess based on the teacher's role.

The teacher is an essential professional for society; many Cuban researchers have referred to the role that the primary teacher must play in the training of new generations.

According to Bonilla (2017) the primary teacher.

(...) the social responsibility of the teacher is the comprehensive education of the youngest generations. The teacher's work opens the way to knowledge of the national history, its facts and heroes, it provides them with basic cognitive, affective and attitudinal tools that allow them to continue their studies and carry out the development of Cuban society. Furthermore, the teacher influences the families of the students and the community in which he/she carries out the educational work (p.1).

This professional must be characterised by a high sense of humanism, as he aspires to the integral development of personality, full fulfilment as a human being and the cultivation of his sensitivity, endowed with the best values and traditions, for the construction of the economic, political and social model to which the country aspires.

CONCLUSIONS

Humanistic training constitutes a component of the educational process at the university, an aspect that has importance in the formation of the personality of students taking the bachelor's degree in primary education in Cuba. In the latest study plan (so called Plan "E") the transversal nature of humanistic training and its impact on the different processes of the degree can be appreciated. However, it is not intentional, systemic and contextualised to the purpose of their profession and professional pedagogical problems.

Humanistic training as a training process that articulates instructive, educational and developmental dimensions must achieve the preparation of the student for the bachelor's degree in primary education in correspondence with the requirements established in the professional model under the direction of the university teachers. The results obtained from the different methods and techniques applied demonstrate that there are insufficiencies in the humanistic training of the students of the bachelor of education degree because it is not intended in a systemic, comprehensive and contextualised way to solve professional problems, hence there is a need to influence the relationship between humanistic training—modes of professional

action—and the teaching professional identity in a way that contributes to teachers’ personal and professional growth.

REFERENCES

- Añorga, J. (2004). *Paradigma Educativo Alternativo para el Mejoramiento Profesional y Humano de los Recursos Laborales y de la Comunidad*. La Paz, Bolivia: Educación Avanzada.
- Arencibia, M. (2021) La formación humanística en los estudiantes universitarios. Refrendado en el volumen 10, número 1, del año 2021 [ISSN: 2310-3647]- [RNPS: 2324]- [Folio 33 -Tomo I]- [RNSW: A 0872] www.horizontepedagogico.rimed.cu
- Betto, F. (2014). *El papel del educador en la formación política de los educandos*. La Habana. Editorial Universitaria Félix Varela.
- Bonilla, A., Breijo, T., y Cruz, J. M. (2017). *La formación histórica del maestro primario: una necesidad en los momentos actuales*. Mendeive. *Revista de Educación*, 15(3), 342-351. Recuperado de: <http://mendeive.upr.edu.cu/index.php/MendeiveUPR/article/view/1162>
- Camacho, Y.C. (2018). *Mediación en conflictos: retos en la formación permanente del maestro primario*. *Revista de Mediación* 11, 2, e10. Recuperado de: <https://revistademediacion.com/wp-content/uploads/2018/07/Revis-ta22-e6.pdf>
- CEPAL. (2018). La Agenda 2030 y los Objetivos de Desarrollo Sostenible: una oportunidad para América Latina y el Caribe. CEPAL. Recuperado a partir de: https://repositorio.cepal.org/bitstream/handle/11362/40155/24/S1801141_es.pdf
- Chacón, N. (2006). *La formación de valores morales. Propuestas de experiencias concretas*. La Habana: Centro de Estudios Educativos; ISPEJV.
- Dakar. (2000). *Las Metas Educativas para el año 2021*. Adoptadas en por los Ministros de Educación Iberoamericanos. Recuperado de: <https://rieoei.org/historico/documentos/rie22a09.htm>
- Esquivel, N. H. (2004). ¿Por qué y para qué la formación humanista en la educación superior? *Revista Ciencia Ergo Sum*. Vol. 10, número 003. Noviembre 2003- febrero 2004. Universidad Autónoma del Estado de México. Soporte electrónico.
- Hernández, Fernández & Baptista. (2014). *Metodología de la investigación*. 6a Edición. México: Interamericana Editores, S.A. De C.V. Recuperado de <https://metodologiaeacs.wordpress.com/.../libro-metodologia-de-lainvestigacion-6ta-e...>
- Hernández, I (2013). *Concepción pedagógica del proceso de formación humanista para los estudiantes de la carrera de medicina. Estrategia para su implementación en la Universidad de Ciencias Médicas de Pinar del Río*. Tesis en

- opción del grado científico de Doctor en Ciencias Pedagógicas. Centro de Estudios de Ciencias de la Educación Superior, Universidad de Pinar del Río
- Hourritinier, P. (2008). *La Universidad Cubana: el modelo de formación*. La Habana: Félix Varela.
- Lastres, E. (2020). *La formación humanista en la educación superior*. Revista Atlante: Cuadernos de Educación y Desarrollo. En línea: <https://www.eumed.net/rev/atlante/2020/06/formacion-humanista.html> <http://hdl.handle.net/20.500.11763/atlante2006formacion-humanist>.
- Mendoza, L. (2005). *Formación humanista e interdisciplinariedad: hacia una determinación categorial*. En L. Mendoza Portales, Didáctica de las Humanidades (pp. 1-18). La Habana: Pueblo y Educación.
- Ministerio de Educación. (2012). Documento base para la implementación del Programa Director para la Educación en el Sistema de Valores de la Revolución Cubana. Formato digital.
- Ministerio de Educación Superior. (2016). Modelo del profesional plan de estudio “E”. Carrera: Licenciatura en Educación Primaria. Material digital.
- Ministerio de Educación Superior. (2016). Documento Base para el diseño de los Planes de Estudio “E”. Material digital.
- Noel, E. (1986). *Humanismo y Ética*. En: El humanismo en México en vísperas del siglo XXI. Actas del Congreso celebrado del 22 al 25 de abril de 1986. Ciudad México. (en soporte electrónico).
- Ortiz, M.J. (2016). *La contextualización sociocultural de la formación humanista*. Tesis en opción al grado científico de doctor en ciencias pedagógicas. Universidad de Oriente.
- Ortiz, M.J., López, J y Álvarez, A.B. (2016). *La formación humanista de los estudiantes de ciencias pedagógicas*. Didáctica y Educación. Vol. VII. Número 6, Edición Especial 291. ISSN 2224-2643 Recuperado de: <https://www.google.com/search?client=firefoxbd&q=LA+FORMACI%C3%93N+HUMANISTA+DE+LOS+ESTUDIANTES+DE+CIENCIAS+PEDAG%C3%93GICAS>
- Pérez, G. et al (1996). *Metodología de la investigación educativa*. 2 tomos. Editorial Pueblo y Educación. La Habana, Cuba.
- Ruiz, A. (1998). *Metodología de la Investigación Educativa*. Ed. UNOESC. Joacaba.
- Ramos, G. (2000). Filosofía y actividad Humana: significación para la formación humanística del profesional universitario de carreras técnicas. Tesis presentada en Opción al Grado Científico de Doctor en Ciencias Filosóficas. Universidad de Matanzas.

European skills strategies: concepts and typologies, theoretical foundations, institutional architecture and political priorities*

Paraskevas Lintzeris**

ABSTRACT

The paper refers to the skills strategies and policies that have prevailed in recent years at European, but to a significant extent also at international level. Skills policies are primarily aimed at serving the needs of the economic and employment models existing on the European continent. Therefore, they exert persistent reform pressures on education systems (especially adult education and training, and higher education ones) to bring them into line with the so-called “needs of the labour market” to increase labour productivity and the availability of a skilled

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and well-placed workforce, while at the same time minimising labour costs. The broader strategic framework for these policies in Europe is the “twin transition” policy, digital and green, which is implemented through initiatives that attempt to link economic priorities with “active employment policies” and vocational training (reskilling or upskilling) policies. After making some necessary introductory clarifications on the multiple dimensions of the concept of skills (definitions, distinctions and basic typologies), the paper addresses the importance of skills policies and focuses on three key aspects of current policies: the theoretical foundations, the mechanisms for the production, dissemination and consolidation of current skills policies, and the institutional architecture as well as the main policy priorities through which the implementation of skills policies is shaped and converges between different European countries.

KEYWORDS

Skills policies, skills mismatch, transformation of work, labour market needs, reskilling, upskilling

INTRODUCTION

Over the last two decades, skills have been a central issue in the broader public debate at European and international level, and in particular in the field of research and policy that intersects two different systems of institutions and social practices: the educational system, especially vocational education and training, and adult education on the one hand, and the economy, mainly the system of production and the employment struc-

ture (content and forms of work and unemployment) that corresponds to it on the other.

Thus, due to the fact that skills link education and training (hence organised learning processes) to work (i.e. the application of available skills, but also the acquisition of new ones through work experience), researchers examine them from two perspectives, on the one hand, from the side of the “outputs” of education (i.e. the knowledge and professional skills as expressed in the certificates of study) as a *supply of skills by individuals* and, on the other hand, from the side of the employment structure, as a *demand for skills by firms*.

From this point of view, skills, as an object of critical research, seem to be constantly at the intersection between education and employment, and efforts to understand their nature and role, especially at present, are connected to significant transformations in work. Therefore, in the context of the current skills debate, some of the questions raised are “What skills does the labour market need today and in the foreseeable future?”, “Do the skills developed by education and training systems meet the needs of the economy?”, “What changes in technology and the economy need to be taken into account by education and training programme developers?”.

Questions like these are far from being politically neutral or beyond conflicting social interests. On the contrary, they depend on the social and historical context, and the answers to them vary according to the ideological starting point and the political perspective from which they are considered.

In the following text, after a brief reference to the available materials and the research methods adopted, the concept of skills will be defined and clarified, the mix of skills that are con-

sidered to be included in almost every education and training activity will be briefly presented, the theoretical origins of skills policies will be highlighted, an explanation of the increasing political interest in skills will be attempted, the main mechanisms for the production of the dominant discourse on skills will be named, and finally the institutional architecture and the main priorities of skills strategies in the EU will be presented and analysed.

1. MATERIAL AND METHODS OF STUDY

The main materials used for the analysis of European skills policies come from fundamental texts of the EU institutions (such as the European Commission) as well as from texts of the main European body for skills development issues, the European Centre for the Development of Vocational Training (CEDEFOP). The materials on concepts, theories and typologies of skills has been drawn from the general body of theoretical approaches to skills that has been developed by three related but distinct disciplines—economic theory and human resources management (especially human capital theory), pedagogy and educational theories, and the sociology of work. The main research techniques used were related to the methods of qualitative social research, namely the review of the relevant literature and the content analysis of the texts examined.

Given the main objective of the study, which is to present, analyse, understand and critically evaluate the skills policies adopted in recent years by all EU countries, as expressed through key policy documents, it was considered that the methodological options of quantitative research were not appropriate at this stage. This decision undoubtedly represents a limitation

of the research: the focus on the analysis of official texts that attempt to document, proclaim and promote specific policy choices. However, it should be accepted that since skills policies are not mere proclamations, but living, practicable policy initiatives that directly affect both education and employment policies, this study needs to be complemented by empirical field research aimed at exploring the impact of these policies and the resistance to them by the education movement and workers' representative organisations.

RESULTS OF THE STUDY

THE CONCEPT OF *SKILLS*

The term “skills” which has a long history, is associated with multiple conceptual definitions as it is used by different disciplines (e.g. Economics, Sociology, Psychology, Social & Political Science, Business Administration, etc.) and in recent years it has become a central element of both educational reforms and employment policies.

According to a widely used definition, a *skill* is “the ability to apply knowledge and use know-how to complete tasks and solve problems” (Cedefop, 2014: 227). Within the European Qualifications Framework (European Union, 2018), skills are described as *cognitive*, which involves the use of logical, intuitive and creative thinking, and *practical*, which involves manual dexterity and the use of methods, materials, tools and instruments.

The concept of skill is usually found next to—and distinguished from—two related concepts:

- *knowledge*, which is understood as an “outcome of assimilation of information through learning. Knowledge is the

- body of facts, principles, theories and practices related to a field of study or work” (Cedefop, 2014: 147) and
- *competence*, which refers to an individual’s “ability to apply learning outcomes adequately in a defined context (education, work, personal or professional development) or the ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development” (Cedefop, 2014: 47).

Regarding the concept of skill, it is worth pointing out that its meaning, as captured and expressed in its use, has changed in recent years. Whereas for a long time, from the end of the 19th to the end of the 20th century, it was clearly associated with *specialised professional competency* (i.e., practical, technical ability rather than “theoretical” knowledge), its contemporary meaning is more expansive and inclusive. Thus, skill, particularly when referred to in phrases such as *skills policies*, *skills development* or *skills shortages*, acts as an “umbrella concept” under which all related concepts, in particular knowledge, skills and attitudes, have been brought. Moreover, the current meaning of the concept includes all those characteristics that are considered necessary for an individual to adapt to changing life conditions, to facilitate his/her career, and to realise the goals set in his/her personal, social and professional life (Kedracka, 2003).

Finally, as Green (2013: 10) stresses, skills are personal qualities with three key features: (a) skills produce value through work (they are *productive*), (b) they can be enhanced by training and development (they are *expandable*) and (c) their importance depends on the specific social-historical context in which they are manifested (they are *social*).

The main reason the concept of skills has been chosen as a central element of contemporary educational policies is that it is a term that brings us closer to the realm of labour market needs (or demands). In this sense, it is a concept that can act as a “link” between, on the one hand, the education system (especially vocational education and training) and organised systems of work-based learning (apprenticeships, traineeships, internships) and, on the other hand, the system of production and the related employment structure. The focus on the importance of skills solely for the economy and employment has led to the neglect of concern for humanistic and social values, attitudes and behaviours that are directly interlinked with the technical dimension of skills and that constitute a dynamic correlation and integrated perspective, which is inherent in educational environments but not in the interests of enterprises (Kedra & Lintzeris, 2022).

TYPOLOGIES OF SKILLS

Researchers, in their attempt to understand and interpret the functions of skills within specific contexts (usually within the various versions of work environments), but also in order to influence the direction of applied skills policies, construct typologies or categorisations, in other words, groupings of individual skills, that express existing ideas and views on the nature and character of skills sets. These classifications embody distinct ideological assumptions and reflect specific meanings of each skill group or even each individual skill, hence constituting a specific framework for understanding a certain, selected set of skill groups. In addition, typologies attempt to represent the

multidimensional nature of skills, as well as the congruities (convergences) between different skills.

In recent years, the expansion and deepening of the social dialogue on skills has led to the elaboration of several skills typologies (Lintzeris & Karalis, 2020). The typical composition of such a typology usually includes at least three main skills categories:

- *Fundamental or basic skills*: these are the knowledge and skills that emerge from initial education and training, and which form the basis for all further development and specialisation throughout social and professional life.
- *Specific occupational / professional skills*, which refer to specialised technical and practical skills related to a profession, a job or a specific task of work.
- *General or generic skills* (or “soft”, socio-emotional, interpersonal, transversal, “life skills”). These include skills such as critical thinking, adaptability, the ability to learn continuously, cooperation, effective communication, negotiation and leadership skills, etc. Furthermore, some elements of one’s personality such as sociability, empathy, reliability, self-confidence, creativity and curiosity are mentioned as generic skills.

A particular feature of the current skills rhetoric is the emphasis on three skill sets: digital and ‘green’ skills (in Europe due to the “twin transition” strategy), entrepreneurship skills and selected socio-emotional skills (European Commission, 2020; Cedefop, 2022).

For socio-emotional skills in particular, it is worth noting that they are often identified with (subjective) character traits, dis-

positions and attitudes that are considered to be adopted when performing an activity (“appropriate” work behaviours). Moreover, socio-emotional skills, as vital work skills, are considered necessary and possible to be measured, assessed and validated (skills certification). Interestingly, however, references to social skills (which, initially, are cultivated through the family, school and the immediate social and cultural environment in which the individual lives) lack a developmental dimension and reference to their crucial role in an individual’s ability to pursue a decent and functional life, and not simply to perform a task effectively.

At the same time, the emphasis on the particular importance of socio-emotional skills in modern workplaces—an assertion that is nowadays “aggressively” promoted by the dominant discourse on skills mainly in the service sectors—has two consequences: on the one hand, an ideological “colonisation” of all spheres of life by the particular ethics, attitudes and wider culture of markets and modern—dependent and alienating—forms of work, and on the other hand, strengthening the tendency towards a (quasi-coercive) “learnification” (Biesta, 2018) of social life, in the sense that learning is transformed from a social right and possibility of personal and collective development and freedom into an individual obligation to adapt to ever-changing needs. Moreover, the development of skills by education and training systems focuses unilaterally on the technical and instrumental aspect of learning and systematically ignores the humanistic and ethical dimension (Lintzeris, 2022), which is nevertheless a vital element of the quality and social relevance of work. The “problem” with the persistent focus on the importance of “soft” skills in the various workplaces of the capitalist world is that some important personal, social and emotional

skills are subordinated to the priorities of economic rationality, thus marginalising their social role and giving them an instrumental and one-sided character.

THEORETICAL FOUNDATIONS OF SKILLS POLICIES

For researchers coming from the fields of economics, sociology of work, management studies and political science, skills are mainly considered as a property of *labour* (which is a factor of production) and in particular as determinants of the quality and specialisation of the *labour power* (i.e., the human capacity to work). Learning theories, educational psychology and adult education theories, on the other hand, consider skills not only from the perspective of work, but also as factors of personal development and social identity formation.

The difference in approach between the disciplines that examine skills is due to the different research questions of each discipline, but also to the particular ideological perspective of each individual theory. For pedagogy, the question is how skills are acquired and developed in education and training systems, but also in on-the-job training (informal or non-formal learning through work experience). For economics, the question is how skills are aligned with the needs of the labour market and subsequently how they are activated in the production of commodities contributing to the creation of economic values. For political science, in particular for comparative political economy, institutions and mechanisms of skills development are an important indicator of the form of macroeconomic policy adopted, but also of the level and quality of the social policies

of each state. For the sociology of work, the research focus is on how skills are involved in the labour process, whether they lead to further upskilling / reskilling or deskilling of workers, how they contribute to the stratification of society and the capital-labour relationship, and how the characterisation of some jobs as “skilled” or some tasks as “high skilled” is often not an “internal” (intrinsic) element of the complex nature of a job, but the result of external hierarchical social determinations.

The theoretical framework that has dominantly influenced skills policies for decades is neoclassical economics. Within the intellectual tradition of neoclassical economics, the current skills discourse is dominated by three approaches: endogenous growth theories, Schumpeterian approaches to the specific role of innovation and knowledge in economic growth, and most of all human capital theory. At the core of human capital theory lies the belief that investment in education and training makes a decisive contribution both to the economic performance of the individual and to the growth of the national economy as a whole. According to this theory, since it is the individual who benefits from the acquisition of skills in the long term, the investment in training should be primarily a rational choice of the individual, who must therefore take personal responsibility, and, without any state assistance, must be flexible and adaptable in order to keep his or her skills in line with the needs of the labour market at any given time. Thus, the transition from “public education for all” to today’s slogans for individualising “lifelong and life-wide learning” and continuous adaptation of skills has evolved into a path of shrinking public education policies, increasing private spending on vocational training and adult education, downgrading the quality of education, and creating a new speculative certification market.

Human capital theory has been strongly criticised by the whole range of “heterodox” economic, social and educational theories (Bowles & Gintis, 1975; Tan, 2014). More importantly, however, is the fact that since the beginning of the 21st century, some of the hitherto “safe assumptions” of the theory have begun to be challenged (Brown et al., 2011). The basic idea of a linear and positive relationship between investment in education and future returns at the individual and aggregate (national economy) level began to be disconfirmed by reality, not only during the global financial crisis of 2008, but also before that. Expectations of upward social mobility through education, cultivated for many decades by political and entrepreneurial elites, began to be unfulfilled for much of the middle class and of course the lower income stratum. However, regardless of the explanatory scope of the theory with regard to the question of the future return on investment in education, a more important problem lies in its fundamental assumption that the main—if not the exclusive—mission of education consists of the acquisition of the technical professional skills required for effective economic activity, and that it is precisely the element of “investment in education” that ensures the prospect of higher levels of income. From this point of view, the idea—and even more so the practice—of reducing education to an activity fully subordinated to the priorities of the capitalist economy, seems to be a constitutive condition of the skills policies prevailing in European countries today, and is directly linked to fundamental assumptions of human capital theory.

THE INCREASING POLITICAL INTEREST IN SKILL ISSUES

The main reason why skills have emerged as an object of intense political interest is that there have been—and are expected to be many more—changes in the production process (consequently in the content and forms of work), in business models, in patterns of consumer behaviour, in means of communication and, by extension, in the whole spectrum of social life. At the same time, successive economic recessions and crises, combined with growing geopolitical upheavals and the consequences of the COVID-19 pandemic, are creating a turbulent environment with uncertain prospects, both locally and internationally.

In a broader framework of reference, the most influential drivers of economic, social and labour transformations are technological change, the climate crisis, the widening of income inequalities, the increase of interdependence due to the internationalisation of economies, change in the sectoral structure of economies (e.g. the growth of the services sector), demographic developments (in particular the ageing population and the projected decline in the working-age population in many countries), increased migration and refugee flows, and last but not least, geopolitical turbulence and its consequences.

In particular, it should be stressed that in any period of significant technology-driven changes in the labour process, the knowledge and skills of workers come back to the forefront of the social and academic debate, mainly because it is considered that skills (a) are a critical determinant of labour productivity, (b) are linked to the emergence and successful adoption of technological and organisational innovations, and (c) are a prerequisite for skilled work (Lintzeris, 2020). Thus, developments in the econ-

omy, the labour process and the employment structure are leading to increased motivation to adapt individuals' skills in order to meet the challenges of the times. These adaptations, in the context of the prevailing political rhetoric, usually take two forms: *upskilling* to match changing job tasks or *reskilling* to acquire a new sum of knowledge and skills for changing occupations.

However, it is useful to remember that policies for upgrading or adapting skills are, to a large extent, a secondary consequence of a primary socio-economic change that is taking place nowadays: the technological transformation that is causing, with the introduction of automation and digital applications, the *deskilling* of workers and the degradation of work (Braverman, 1998), given the orientation of the “market economy” towards unrestrained accumulation, the pursuit of increased productivity and the greatest possible profitability of the few. Under the prevalence of such a mode of production, exchange and consumption, the directions and uses of technology are subordinated to the priorities of capitalist regulation of socio-economic affairs (MacKenzie & Wajcman, 2009), with negative consequences for the work and life of the majority of workers.

The fact that skills have risen high on the agenda of political priorities worldwide is shown—among other things—by the fact that special mechanisms have been set up to produce theory and policy exclusively on this issue. Thus, some of the major international organisations such as the International Labour Organisation (ILO, 2018) the Organisation for Economic Cooperation and Development (OECD, 2019), the World Bank, bodies such as the World Economic Forum, universities and research centres have set up departments and agencies that produce a huge amount of research data, documentation, recommendations, and other materials on the basis of which each country

is called upon to adapt its policies, in particular its education systems and labour market arrangements. The EU, through specific decisions supported by the work of relevant organisations (CEDEFOP, ETF) and, by extension, all Member States, has established mechanisms for implementing skills policies. Therefore, the vast majority of the skills discourse (i.e. the scientific research, theoretical and empirical grounding and policy texts etc.) is produced by a relatively small number of highly influential organisations and research institutes and then systematically disseminated to both decision-makers and citizens at large, through communication networks and, of course, through the policies implemented.

At the same time, a fundamental material force driving skills policies is the generous support of relevant initiatives from the most important funding sources such as, for Europe, the European Social Fund and the newly established Recovery and Resilience Fund. The inclusion of skills policy initiatives in the above-mentioned funding schemes has a decisive impact on their targeting and content, since only what is in line with the formal and detailed EU policy guidelines and axes is eligible for financial support.

ORIENTATIONS AND INSTITUTIONAL ARCHITECTURE OF SKILL POLICIES IN THE EUROPEAN UNION

The EU's skills strategy is expressed through specific policy documents and operational programmes. It is also accompanied by the creation of relevant institutional arrangements. In this context, all EU Member States have developed national skills strategies, adopted methods and tools for skills development

and put in place mechanisms to identify skills needs and align skills with labour market needs (Lalioti, 2019).

What is called a skills strategy in the EU is in fact a complex set of interlinked policy initiatives and actions. To understand the “institutional map”, but also the many dimensions and distinct levels of intervention for skills, one has to navigate among several different policy documents, institutional initiatives, operational programmes and funding frameworks. In the context of this complexity, which incidentally requires, but also sustains, a large body of technocrats, the most central policy initiative is the European Skills Agenda. The European Skills Agenda is a five-year programme launched in 2016 (European Commission, 2016) and renewed in 2020 (European Commission, 2020). It includes 12 actions divided into four axes (see Table 1).

Table 1: European Skills Agenda 2020-2025

i. <i>A call to join forces in a collective action:</i>
Action 1: A Pact for Skills
ii. <i>Actions to ensure that people have the right skills for jobs:</i>
Action 2: Strengthening skills intelligence
Action 3: EU support for strategic national upskilling action
Action 4: Proposal for a Council Recommendation on vocational education and training (VET)
Action 5: Rolling out the European Universities Initiative and upskilling scientists
Action 6: Skills to support the twin transitions
Action 7: Increasing Science, Technology, Engineering, Maths graduates and fostering entrepreneurial and transversal skill
Action 8: Skills for life

iii. *Tools and initiatives to support people in their lifelong learning pathways:*

Action 9: Initiative on individual learning accounts

Action 10: A European approach to micro-credentials

Action 11: New Europass platform

iv. *A framework to unlock investments in skills:*

Action 12: Improving the enabling framework to unlock Member States' and private investments in skills

Source: European Commission, 2020

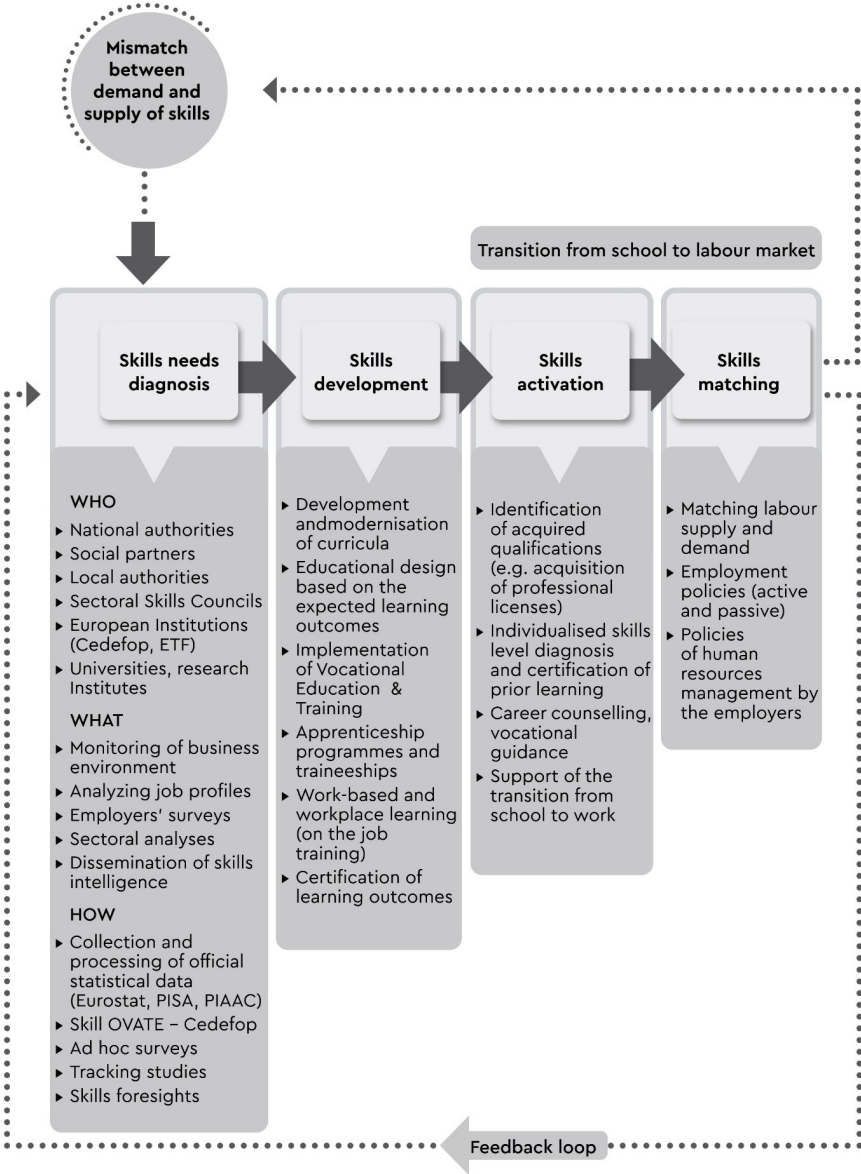
The European Skills Agenda outlines the EU's policy priorities. Its 12 actions focus on coordinated efforts and encouragement of joint initiatives between different countries and organisations; the formulation of national action plans for the implementation, monitoring and evaluation of skills policies; the interconnection with green and digital transformation policies; the development of tools to facilitate people's acquisition and certification of skills; the transition from education to work and the enhancement of educational and labour mobility; and finally the mobilisation of public and private financial resources to support the actions.

In order to improve the effectiveness of skills policies, their implementation is linked to a set of supporting mechanisms, the most important of which are the monitoring and diagnostic systems for skills needs (see Cedefop's Skills Intelligence), the European Qualifications Framework (EQF), the multilingual classification of European Skills, Competences, and Occupations (ESCO), the European Quality Assurance Framework for Vocational Education and Training (EQAVET) and a set of

common European documents, Europass, including a CV template and a tool for self-assessment of digital skills and comparison of qualifications. Furthermore, skills policies are not only practised at the broader European or regional / national level, but also at sectoral and occupational level with the creation of Sectoral Skills Alliances, which are transnational projects aiming to identify skills mismatches in a specific sector and to propose educational contents for vocational education and training providers to address problems.

The main institutional arrangements (structures, mechanisms and regulatory frameworks) that are called upon to support skills policies are articulated along an axis (see Figure 1) that starts with the *diagnosis of skills needs* (including the study and monitoring of occupational profiles and the updating of skills development systems for changes in the economy and the labour market that affect the content of education) and continues with the process of *adapting educational content, materials and tools* and with the *development of skills* (general and vocational education and training, certification of learning outcomes, recognition of certificates, etc.), *activation of skills* (vocational guidance, career counselling and support for the transition from education to work) and, finally, *matching and application of skills* to different jobs.

Figure 1: Institutional architecture of skills policies



2. DISCUSSION ON EUROPEAN SKILLS POLICIES

Primary and key assumptions of current skills policies—although for many researchers, poorly documented—are that:

- There is a notable mismatch between the supply and the demand of skills (Cedefop, 2010), so businesses cannot meet their staffing needs. Indeed, the mismatch will tend to grow as the process of automation, digitalisation and technological transformation progresses.
- The investment awakening of capital after the prolonged economic crisis and the economic consequences of the pandemic and the war in Ukraine is hindered in many European countries by the low or inappropriate level of skills of individuals, while it is estimated that reskilling or upskilling human resources is expected to improve labour productivity and thus the competitiveness and profitability of firms.
- The shift of young people towards vocational education and training (instead of general education) should reduce high unemployment rates and shorten the transition from school to work, while facilitating their social inclusion.

On the other hand, according to the critics on the prevailing view,

- Labour supply and demand asymmetries cannot be explained solely by any skills mismatches because many other factors such as pay levels, working conditions, and career prospects, are involved in the process of making employment choices or in the recruitment procedures.

- Estimates of the impact of digital and technological transformation on occupations and job content are both differentiated according to industry, firm size and other factors, and in many cases excessive. In fact, digitalisation and automation are expected to affect specific working tasks within occupations rather than to eliminate a large number of specialisations overall (Lapatsioras et al., 2020).
- Labour productivity, which is considered to be the “winner” of upgraded skills of human resources, depends not only on the knowledge and skills of workers / employees, but also on factors such as the availability of appropriate technical—technological equipment and the organisation of work within the production unit (Lintzeris, 2017).
- Public interventions on skills are focused exclusively on the supply side (i.e., the existing skills of individuals), considering that the only option for policy initiatives is to match supply to the employer-driven demand for skills. The opposite option is out of the question, so the overall political treatment of the various skills issues is limited to the “obligation” of education and training to adapt to the—usually short-term—needs of enterprises. In this sense, for example, the phenomenon of over-education (a phenomenon that is particularly manifested in Greece) is supposed to be a problem, rather than an opportunity for employers to use the available high skills for an effective shift in their investment strategies. However, this understanding of the relationship between skills supply and demand, turns what is essentially an economic and developmental problem into an “educational problem”.

CONCLUSION

This paper has attempted to present and interpret the main orientations and dimensions of skills strategies prevailing in the EU. The direct link between dominant skills policies and neoclassical economic approaches, in particular the influence of human capital theory in conceptualising the relationship between skills acquisition and the individual's labour market trajectory, has been identified.

It was considered that a key reason why skills policies have come to the fore with intensity is the belief that the technological and organisational transformations taking place in the production, distribution and consumption of goods and services—changes with significant implications for human labour as well as for the relationship between humans and machines in the workplace—require the continuous adaptation of workers' skills in order to maintain or increase labour productivity, competitiveness and profitability of capital, but at the same time to achieve the social consensus that will ensure broader systemic stability as a precondition for the achievement of economic objectives.

However, the wider policies implemented by governments (especially with reference to the case of Europe) have resulted in, among other things, an increase in social inequality, high unemployment rates, qualifications and pay mismatches, reproduction of gender and cultural discrimination, austerity and economic problems for the majority of the population. These situations are deliberately interpreted as “natural phenomena” and temporary side-effects of the “free market” operation.

Εσοχή is an attempt to implement an important part of the skills policies through the reform of education systems towards

the adoption of a “modern skills mix” combining basic skills or key competences, socio-emotional and technical professional skills with an eye to the prospects of the economy and the needs of the labour market. This educational framework, which is aimed at the majority of young people, provides a combination of a minimum of basic knowledge, early vocational training and the simultaneous acquisition of selected behavioural skills in line with dominant cultural values such as competition, entrepreneurship, active obedience and communicative effectiveness. Such a version of an education system, combined to the urgency of messages and interventions for lifelong learning and individual care for self-development and continuous updating of work skills throughout adulthood, tends to establish a model of a stressed, fearful, overworked and compliant citizen and worker or, in a euphemistic formulation of the neoliberal vocabulary, a “worker-entrepreneur of oneself” (Dardot & Laval, 2014). In this context, the main argument in the paper is that dominant skills policies are one-sidedly oriented towards the goals of economic efficiency, pushing away or marginalising all the non-instrumental, moral-value and social dimensions of education, training and also work.

REFERENCES

- Biesta, G. (2018). Interrupting the politics of learning. In Knud Illeris (ed) *Learning Theorists ... In Their Own Words*, chapter 18, pp. 243-258. London and New York: Routledge
- Bowles, S. & Gintis, H. (1975). The Problem with Human Capital Theory--A Marxian Critique. *The American Economic Review*, 65 (2), pp. 74-82
- Braverman, H. (1998). *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*. NYU Press. <http://www.jstor.org/stable/j.ctt9qfrkf>
- Brown, P., Lauder H. & Ashton, D. (2011). *The Global Auction. The Broken Promises of Education, Jobs and Incomes*. Oxford University Press

- Cedefop (2010). *Skill mismatch in Europe*. Briefing Note 9023 EN. Thessaloniki, Greece: CEDEFOP
- Cedefop (2014). *Terminology of European education and training policy. Second edition. A selection of 130 key terms*. Luxembourg: Publications Office of the European Union.
- Cedefop (2022). *Strengthening skills systems in times of transition. Insights from Cedefop's 2022 European skill index*. Thessaloniki, Greece: Cedefop
- Dardot, P. & Laval, C. (2014). *The New Way of the World: On Neoliberal Society*, trans. Gregory Elliot. London, U.K.: Verso Books
- European Commission (2016). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A new skills agenda for Europe. Working together to strengthen human capital, employability and competitiveness {SWD (2016) 195 final} Brussels, 10.6.2016, COM (2016) 381 final.
- European Commission (2020). *European Skills Agenda for sustainable competitiveness, social fairness and resilience* {SWD (2020) 121 final}—{SWD (2020) 122 final} Brussels, 1.7.2020, COM (2020) 274 final
- European Union (2018). *The European Qualifications Framework: supporting learning, work and cross-border mobility*. Luxembourg: Publications Office of the European Union
- Green, F. (2013). *Skills and Skilled Work: An Economic and Social Analysis*. Oxford, UK & New York: Oxford University Press
- ILO (International Labour Organization) (2018). Skills policies and systems for a future workforce, *Issue Briefs*, No. 8, https://www.ilo.org/skills/WCMS_618170/lang-en/index.htm
- Kedra, A. (2003). Ψυχολογική Αξιολόγηση Σύγχρονων Επαγγελματικών Δεξιοτήτων [Psychological evaluation of modern vocational / professional skills] (PhD thesis). National and Kapodistrian University of Athens. [In Greek].
- Kedra, A. & Lintzeris, P. (2022) Οριοθέτηση, διαστάσεις και νοηματοδοτήσεις του όρου «δεξιότητες» [Definitions, dimensions and meanings of the term «skills»], Presentation at the Hellenic Adult Education Association's Conference *Skills Development in Adult Education and School Education*, 5-8 May 2022 (under publication) [In Greek]
- Lalioti, B. (2019). Στρατηγικές Δεξιοτήτων: Αναζητώντας τις Βασικές Αρχές και τα Δομικά Συστατικά τους [Skill strategies: looking for the basic principles and their building blocks]. Athens: National Institute of Labour & Human Resources (N.I.L.H.R.) [In Greek]
- Lapatsioras, S., Milios, G. & Mihailidis, P. (2020). Οι επιπτώσεις της ψηφιοποίησης στην αγορά εργασίας [The impact of digitisation on the labour market]. Athens: Labour Institute—General Confederation of Greek Workers (INE GSEE) [In Greek]

- Lintzeris, P. & Karalis, T. (2020). Towards an inclusive skills typology. *European Journal of Social Sciences Studies*, 5 (1). Available on-line at: www.oapub.org/soc, doi: 10.5281/zenodo.3728247
- Lintzeris, P. (2017). Πολιτικές δεξιοτήτων: Σχόλια για τον ρόλο των δεξιοτήτων στην οικονομία, την εργασιακή διαδικασία και την επαγγελματική κατάρτιση [Skill policies: Comments on the role of skills in the economy, labour process and vocational training]. Chapter in the book (collection of articles) Ch. Goulas, and P. Lintzeris (eds) *Lifelong learning, vocational training, employment and economy: New facts, priorities and challenges*. Athens: IME GSEVEE and INE GSEE, pp. 67-101 [In Greek]
- Lintzeris, P. (2020). Τεχνολογική αλλαγή, ψηφιοποίηση, εργασία και δεξιότητες [Technological change, digitalization, labour and skills]. Working Papers IME GSEVEE, no 14, pages 44. Athens: Small Enterprises Institute—Hellenic Confederation of Professionals Craftsmen and Merchants (IME GSEVEE) [In Greek]
- Lintzeris, P. (2022). Η εμπειρία της πανδημίας ως αφορμή κριτικού αναστοχασμού επί της κυρίαρχης προσέγγισης του μείγματος δεξιοτήτων [The experience of the pandemic as an occasion for critical reflection on the dominant approach to the skills mixture]. In P. Lintzeris & D. Valasi (Eds.). *Η εμπειρία της πανδημίας της νόσου Covid-19 στην εκπαίδευση και κατάρτιση ενηλίκων στην Ελλάδα: διαστάσεις, συνέπειες, προοπτικές* [The experience of the Covid-19 pandemic in adult education and training in Greece: dimensions, consequences, perspectives] Athens: IME GSEVEE [In Greek]
- MacKenzie, Donald and Wajcman, Judy, eds. (1999). *The social shaping of technology*. 2nd ed. Buckingham, UK: Open University Press
- OECD (2019). *Future of Education and Skills 2030. Conceptual learning framework. Concept note: Skills for 2030*. http://www.oecd.org/education/2030-project/contact/OECD_Learning_Compass_2030_Concept_Note_Series.pdf
- Tan, E. (2014). Human Capital Theory: A Holistic Criticism. *Review of Educational Research*, 84 (3), pp. 411-445, doi: 10.3102/0034654314532696

Education for Entrepreneurship: a comparative study between Sweden and Greece*

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ABSTRACT

This chapter explores the phenomenon of entrepreneurship through a pedagogical and didactical lens, as well as its social dimension, focusing on the cases of Sweden and Greece. The selection of these countries is based on their representation of two different regions of the European Union, and the successful integration of Junior Achievement (JA) programmes within their respective educational systems. The study argues that intentional pedagogical actions, aligned with curricular goals

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and instructional models, can foster an entrepreneurial mindset and readiness for action. The historical foundations of entrepreneurship education are outlined and various policy discourses are analysed at international and national levels, with an investigation of how these are reflected in secondary-level curricula within the Greek and Swedish contexts. Central to the study is an exploration of the competencies that entrepreneurship education aims to develop, the underlying assumptions, and the intended purposes. Analysing school curricula in Greece and Sweden, the paper examines how pedagogical approaches facilitate the development of entrepreneurial skills. Although both countries integrate entrepreneurship into their national curricula, Sweden has a longstanding tradition, while Greece has made recent progress. Teacher training emerges as a significant concern in Greece, with efforts made by the government and organisations like JA Greece to equip educators with the necessary knowledge and pedagogical approaches for effective entrepreneurial education. The paper concludes by acknowledging that this study represents an initial comparative approach and aims to shed light on essential aspects of entrepreneurship education, emphasising its potential as a valuable tool for young people's skills development and preparation for the professional world.

KEYWORDS

Entrepreneurship education, entrepreneurial skills/competencies, youth development, teachers' training, Junior Achievement (JA).

RATIONALE AND RESEARCH CONTEXT

Ontologically, man is innovative in nature, takes the initiative, is proactive, finds solutions to problems, works with others, and creates opportunities of added value. All these entrepreneurial abilities are developed in environments with certain social, political, and cultural conditions prevailing in a particular place (country, enterprise, association) at a given time. Entrepreneurship is not only about realising ideas that produce economic and other benefits to improve the living conditions of individuals and collectives, but also about daring to take risks, create solutions, develop and organise networks, and see opportunities instead of problems.

In our chapter, we approach the phenomenon of entrepreneurship in two countries, Sweden and Greece, from a pedagogical and didactical perspective as well as from its social dimension. These countries were selected on the basis of certain characteristics, namely a) they are both EU Member States representing the Northern and the Southern regions respectively, b) they have almost the same population; the population of Greece is approximately 10.7 million people and that of Sweden is about 10.5 million people, according to the UN World Population Fund data for 2022, and c) national branches of the international organisation Junior Achievement (JA) Worldwide have operated in both countries for just a few decades with great success and have penetrated the educational systems of each country.

Taking the examples of entrepreneurship development in these two countries, we assert that entrepreneurship as a state of mind and readiness for action is preferably the outcome of intentional pedagogical actions, based on curricular goals and

instructional models. Against the background of a historical account of entrepreneurship as an educational subject—its what, how, and why—a review of different policy discourses at the international and national levels will be conducted to examine how these are reflected in curricula at a secondary level using examples from the Greek and the Swedish contexts. The main questions addressed are: what kind of competencies does entrepreneurship education aim to develop, for what reason, and for what purpose?

THE NOTION OF ENTREPRENEURSHIP: AN INTRODUCTORY BACKGROUND

It is not clear what entrepreneurship is, but this does not prevent the appearance of a plethora of definitions in the relevant scholarly literature. Common to the overriding majority of these is that in one way or another, they refer to and attribute entrepreneurship to personal qualities, characteristics and goals, and to strategies and tactics framed by specific contexts and time (Chang & Wyszomirski, 2015). Some of the definitions perceive entrepreneurship as a process of a successful organisation, while others understand entrepreneurship as a matter of mindset and skills (see Diandra & Azmy, 2020). Entrepreneurship is also defined as a distinct academic discipline in its own right that can operate both autonomously and in an interdisciplinary manner (Crocì, 2016), and as a practice that “begins with action and creation of new organisation” (Barot, 2015).

Ultimately, entrepreneurship is linked to the generation of job opportunities, increases in productivity, improvements in living standards, and economic growth and development

in general. Against this background, it is not surprising that entrepreneurship has been promoted over the past three decades in countries that achieved substantial poverty reduction, as in the case of China. It is no wonder either that donors and international development agencies have been turning to entrepreneurship to improve the effectiveness and sustainability of aid (see Diandra & Azmy, 2020; Naudé, 2013). Entrepreneurship, essentially, is mainly concerned with why, when, and how individuals attempt to create value by exploiting opportunities under uncertain conditions (see Institute for Global Research, 2017).

Although there is an established tradition within the field dating back in time, entrepreneurship is relatively young in terms of educational settings. The researcher most associated with a theory of entrepreneurship is the economist Joseph A. Schumpeter*, who linked entrepreneurship with economic development and introduced the modern definition of entrepreneurship in 1934. Schumpeter argued that the innovation and technological change of a nation come from the entrepreneurs or wild spirits, and asserted that “... the doing of new things or the doing of things that are already being done in a new way” (Schumpeter, 1947) is due to the efforts of entrepreneurs. For Schumpeter, the entrepreneur is “the prime agent of change”.

* Joseph Alois Schumpeter (1883–1950). Political economist, professor at Harvard University, also known for having popularised the term “creative destruction” in his classical work “Capitalism, Socialism and Democracy” from 1942, to describe the dismantling of longstanding practices in order to make way for new technologies, new kinds of products, new methods of production, and new means of distribution. (https://en.wikipedia.org/wiki/Joseph_Schumpeter)

Entrepreneurship encompasses more than just the implementation of innovative ideas with potential economic and societal benefits, aimed at improving the well-being of individuals and communities. It also involves the development of specific skills and competences, such as initiative-taking, problem-solving, collaboration, network creation, and adoption of an opportunity-driven mindset rather than focusing solely on problems. Entrepreneurship as a state of mind and readiness for action is the outcome of pedagogical actions, based on curricular goals and instructional models. In this paper, along with a general overview of different educational policy discourses at international and national levels about the field of entrepreneurship, an account will be given of the educational potential of entrepreneurship.

THE EDUCATIONAL POTENTIAL OF ENTREPRENEURSHIP

Entrepreneurship has grown to become an important and relevant field of study. In fact, entrepreneurship has developed within different fields of knowledge, and this explains its interdisciplinary character but at the same time, it is tied to the disciplines within which it has emerged. To consider a field of knowledge as a distinct discipline requires the presence of certain factors such as scholarly publications, systems of entrepreneurial education including teaching and mentoring availability, social networks and reward systems, and empirical phenomena that can only be explained pedagogically through entrepreneurship (Crocì, 2016; Shane & Venkataraman, 2000). Howard Aldrich outlined some forces similar to these features that since the

1970s have contributed to the institutionalisation of the growing and ever-changing field of entrepreneurship, so that it is now an academic discipline all over the world. These forces are:

First, a social structure facilitating connections between entrepreneurship researchers has emerged as a result of social networking mechanisms. Second, publication opportunities have increased dramatically in books and journals, and increasingly in digital formats. Third, training and mentoring has moved from the old apprenticeship system to a much more collective model. Fourth, major foundations and many other smaller funding sources have infused the field with enough money to change the scale and scope of entrepreneurship research. Fifth, new mechanisms have emerged that recognize and reward individual scholarship, reinforcing the identity of entrepreneurship research as a field and attracting new scholars into it. Sixth and finally, underlying all five of the mechanisms identified above is the increasing globalization of the field.

(Aldrich, 2012)

Although entrepreneurship is an old phenomenon in human existence and the economy, its “intrusion” into educational institutions is relatively new. Universities and national economic policies have played a crucial role in promoting the institutionalisation of entrepreneurship through the financing of research and chairs in entrepreneurship, such as in Germany, and the establishment of entrepreneurship centres, such as in the Netherlands (a.a.).

Why entrepreneurship started to become included in more and more countries’ curricula and education is explained by desirable qualities and abilities –*competencies*– that contribute

to the advancement of new products, technology, and more innovative production methods that lead to improving the standards of living. Standards of living refer not only to material factors such as income, gross domestic product (GDP), life expectancy, and access to opportunities in the economy and society; they are also closely related to the quality of life for individuals and collectives, with respect to factors such as economic, political, cultural and environmental sustainability, as well as the right to exercise freedom under responsibility, meaning “*the free development of each is the condition for the free development of all*” (Marx & Engels, 1848).

Although Schumpeter’s ideas helped to establish entrepreneurship as an empirical field of study, it was not until the late 1940s that entrepreneurship began to be taught as a discipline at Harvard Business School. In the wake of this, many conferences and courses, as well as associations and publications, were organised to disseminate the field’s knowledge to a wider public and create awareness of entrepreneurship. The number of training courses offered is an indicator of the attitude to and status of entrepreneurship in a society (Crocì, 2016). According to Krueger (2002), entrepreneurial programmes are evolving in two dimensions: in terms of the number of courses and the degree of integration of entrepreneurial courses. For example, cooperative entrepreneurship activities that include the participation of entrepreneurs, entrepreneurship clubs, internships, and placement of entrepreneurship graduates can be viewed as another type of integration beyond a classical interdisciplinary design or combined programmes.

Crocì concludes her inquiry on entrepreneurship as a knowledge realm by stating:

Entrepreneurship is a unique phenomenon in that it produces distinctive research, but cannot be constrained by the framework of a discipline. To limit the field to only one area would be problematic. Many of the questions that the field raises can be answered by other disciplines, but what separates entrepreneurship research is the ability to analyze and summarize all of these viewpoints in a comprehensive study of the start-up. The ability to constantly evolve and change is essential to the field. Just like the entrepreneurs they study, entrepreneurial researchers need to be able to adapt and follow trends. By being placed outside of an academic construct, entrepreneurship research retains flexibility. (...)

Teaching and mentoring systems in entrepreneurship are still varied across college campuses. There is no true formula to teach entrepreneurship. (...)

Entrepreneurship was formed through interdisciplinary and will thrive through remaining interdisciplinary.
(Crocì, 2016)

THE MULTIFACETED ENTREPRENEURSHIP AND ITS SOCIAL DIMENSION

Entrepreneurship is often defined as the process of creating new businesses or innovative products and services (Gartner, 1988). However, this narrow definition fails to capture the multifaceted nature of entrepreneurship. Without doubt, entrepreneurship is an essential element of the economic growth of a society (Shane & Venkataraman, 2000). It enables individuals to transform innovative ideas into successful business ventures, creating job opportunities and increasing the overall productivity and

competitiveness of a region or even a country. Additionally, many associate entrepreneurship with economic activity aimed at generating as much profit as possible for the entrepreneurs. It may also be the case that different individuals are motivated to start a business for different reasons, but the common thread is that they are all doing it for their own benefit.

However, entrepreneurship is not limited to its economic dimension. Multifaceted entrepreneurship involves a broader social dimension that encompasses various aspects of societal development and refers to the diverse range of activities that entrepreneurs engage in, beyond creating new businesses or products. These activities include social entrepreneurship, sustainable entrepreneurship, and cultural entrepreneurship, among others.

One type of entrepreneurship, with a large and widespread development in recent years, has an exclusively social orientation. It is named *social entrepreneurship* to indicate the process by which individuals, start-ups and entrepreneurs operate to address social issues. Social entrepreneurs are therefore individuals who run businesses aiming to have a positive impact on their community/society, the environment and the world. Like private entrepreneurs, social entrepreneurs also exist in all sectors of society and strive for profit through their business activities, but the difference between private and social entrepreneurship is that profit in the latter case is a means to achieve the company's socially beneficial goals. The profits of a social enterprise are therefore often reinvested in the enterprise or used to support other socially beneficial purposes rather than being distributed as profits to the owners. Social entrepreneurship is a type of entrepreneurship that focuses on creating social value, rather than solely gener-

ating profits (Dees, 1998). Social entrepreneurs identify social problems and develop innovative solutions that address them, often through the creation of non-profit organisations or socially-oriented for-profit businesses. In total, social entrepreneurship focuses on the so-called 'triple bottom line' of people, planet and profit, ensuring that return on investment is accompanied by a return to the society (Betts, Laud & Kretinin, 2018).

In the same way, sustainable entrepreneurship is focused on developing environmentally sustainable business models (Shepherd & Patzelt, 2011). Sustainable entrepreneurs seek to minimise the negative impact of their business on the environment and contribute to the overall sustainability of society. Finally, cultural entrepreneurship involves the creation of businesses or products that reflect cultural values, traditions, or heritage (Hennig-Thurau et al., 2010). Cultural entrepreneurs identify unique cultural assets and develop products or services that celebrate and promote them, often with the aim of preserving or revitalising cultural traditions.

These different types of entrepreneurship demonstrate the diversity and complexity of related activities, highlighting the multidimensional nature of entrepreneurship and its social dimension. One of the most significant contributions of entrepreneurship to society is job creation (Audretsch & Thurik, 2001). Entrepreneurial activities create new job opportunities, particularly in sectors where traditional employment is limited or unavailable. Small and medium-sized enterprises (SMEs) are particularly important in this regard, as they account for a significant proportion of job creation in many countries. According to the World Bank, SMEs account for about 90% of businesses and more than 50% of employment worldwide (World Bank,

2020). Entrepreneurship, therefore, plays a critical role in reducing unemployment and promoting economic growth.

Entrepreneurship can also have a significant social impact. Social entrepreneurship, in particular, is focused on addressing social problems, such as poverty, inequality, and lack of access to basic services (Austin et al., 2006). Social entrepreneurs develop innovative solutions that address these problems, often through the creation of non-profit organisations or socially-oriented for-profit businesses, such as Grameen Bank, founded by Nobel Peace Prize winner Muhammad Yunus, which provides microfinance loans to poor women in rural Bangladesh, enabling them to start their own businesses and improve their living standards.*

ENTREPRENEURSHIP AS A SKILL, ACTIVITY, KNOWLEDGE AND ATTITUDE

Entrepreneurship has been described by supranational organisations, such as the OECD and the EU (Lack us, 2015; Carayannis, Jones, Liargovas & Apostolopoulos, 2020), as well as by national governments and other policy actors, as increasingly important to maintain in the fierce competition that exists in today's globalised knowledge society. In that respect, Sweden and Greece, whose contexts will be discussed in this paper, are no exception and the arguments put forward in the public sphere are essentially very similar to those of other Western countries. As expected, school and education in general, are attributed a

* Find more about the work and the life of M. Yunus here: https://en.wikipedia.org/wiki/Muhammad_Yunus

key role in fostering an entrepreneurial mindset in students and promoting entrepreneurship in society.

Nevertheless, it takes more than an entrepreneurial spirit to be competitive. To remain competitive in the global economy today, societies are dependent on access to information, technology and knowledge. Thomas Friedman, the famous American journalist, in his book, *The World is Flat*, states:

(A)ny job—blue or white collar—that can be broken down into a routine and transformed into bits and bytes can now be exported to other countries where there is a rapidly increasing number of highly educated ‘knowledge workers’ who will work for a small fraction of the salary of a comparable American worker.

(Friedman, 2005 in Wagner, 2008, p. xiv)

Note that Friedman’s vantage point is the USA but this also applies to most of the rest of the Western world. What matters is the impact of technological and productive transformations on the globalised economy and the future of the younger generations. How do we as a society prepare and educate our youth (and not only them) so that they can creatively integrate into the labour market and prosper? What skills do our young people need to have developed, for which labour market and what kind of society and economy? Is the education system adequately equipped to meet the multi-layered challenges of today and tomorrow?

Tony Wagner, a professor at the Harvard Graduate School of Education, makes the following observation in his book *The Global Achievement Gap*, subtitled “Why even our best schools are not teaching the new survival skills our children need—and what we can do about it”:

The failure to give all students these new skills leaves today's youth—and our country—at an alarming competitive disadvantage. Schools haven't changed; the world has. And so our schools, then, are not failing. They are obsolete—even the ones that score the best on standardised tests.

(Wagner, 2008, p. xxi)

Well, what are the skills we need to develop and why? Learning basic skills—reading, writing, and arithmetic (the three “Rs”) is unquestionably very important, although it is not enough. It has to be combined with learning how to think, reason, analyse, solve problems and communicate effectively to be in a position to meet the demands and challenges of our time; not only challenges with regard to labour market integration but also the challenges of the technological revolution, climate change and the resulting social disruptions. Wagner identifies *survival skills*, the skills that make modern people “employable”, capable of learning, and able to participate actively and responsibly in the public sphere. These are:

1. The ability to ask good questions, which is a key component of the ability to think critically and solve problems, whether in the professional, social or personal spheres
2. Networking (cooperation-teamwork) and leadership (leading by influence)
3. Agility and adaptability
4. Initiative and entrepreneurship
5. Effective oral and written communication
6. Accessibility to information and the ability to analyse information
7. Curiosity and imagination

Actually, entrepreneurship is one of the eight key competences included in the EU recommendations on lifelong learning (European Commission, 2019). These competences are identified as essential to citizens to ensure personal fulfilment, a healthy and sustainable lifestyle, employability, active citizenship and social inclusion. The recommendations encourage Member States to provide all learners access to learning opportunities, to achieve their full potential, adapted to their different needs. The eight key competences consist of a combination of knowledge, skills and attitudes and are the following:

1. Literacy competence
2. Multilingual competence
3. Mathematical competence and competence in science, technology and engineering
4. Digital competence
5. Personal, social and learning to learn competence
6. Citizenship competence
7. Entrepreneurship competence
8. Cultural awareness and expression competence

The EU describes *entrepreneurship competence* as “the capacity to act upon opportunities and ideas, and to transform them into values for others. It is founded upon creativity, critical thinking and problem-solving, taking the initiative, perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social or financial value”. It also includes a desire to motivate others, and valuing their ideas, and emphasises the importance of ethical responsibility and empathy for other people and the world around us (a.a).

Obviously, the above lists cannot be complete and attempts are constantly being made to categorise the skills that are con-

sidered important for individual and collective progress and well-being. However, each one is considered important and functional only in conjunction with the others, as each reinforces the other so that the development of the individual can be holistic and all-round. With this in mind, the strengthening of entrepreneurial skills has been at the heart of educational policy in recent decades, because it is widely assumed that this is what the highly competitive environment of today's globalised knowledge society demands.

The "homo entrepreneur" emerges from multiple educational policy texts as the new model citizen of our post-modern era with various desirable characteristics: a restless spirit, creative, self-confident and with many other dynamic abilities. Individual prosperity, if not the very survival of society, seems to depend on whether the education system succeeds in equipping students with the qualities and abilities attributed to the entrepreneur. There is no reason to doubt that this may be the case, and probably most people agree with that. Any debate should then focus on the pedagogical challenge of entrepreneurship education formulated in terms of questions like:

- What kind of society do we want to prepare our students for and what kind of entrepreneurial skills should schools supply them with?
- What exactly does it mean to have critical thinking, to be creative and self-directed, to take the initiative and at the same time be social and cooperative?
- Are these qualities and skills aimed at everyone or only at a few selected persons?

And most importantly:

- What kind of education is required and how should teaching about entrepreneurship be designed?

To answer all these questions, it is necessary to clarify the way in which entrepreneurship is defined and apprehended. From a narrow point of view, as already mentioned, entrepreneurial learning focuses on the economy, while in a broader sense, it is related to pedagogy and education in general. Thus, according to the economic dimension, entrepreneurial learning is oriented towards the design and operation of a business. However, the promotion of entrepreneurship in its wider meaning, which habitually appears in official educational policy documents, aims to cultivate all those characteristics and dispositions attributed to the individual ‘entrepreneur’, i.e. someone who is entrepreneurial, who creates, who is flexible, who is able to think, make decisions, etc.

Another distinction between different forms of learning about entrepreneurship is between education **about** entrepreneurship, education **in** and education **in** entrepreneurship. The Swedish Organisation for Economic and Regional Development, Nutek*, understands and defines this difference as follows in an information sheet from 2007:

* Nutek, or Verket för näringslivsutveckling (The Swedish Agency for Economic and Regional Growth) was a government agency with the task of strengthening the business environment and promoting sustainable regional development. Nutek was abolished in 2009 and its activities were merged with others into a new organisational structure.

Education **about** entrepreneurship includes knowledge about the nature and conditions of entrepreneurship. It provides a deeper understanding and insight into the way the entrepreneur thinks and acts. Many university courses with the title entrepreneurship fall into this category. The effect of this type of education is an increased understanding of entrepreneurs in society, and that is necessary to create a good regulatory system and social climate for entrepreneurs. Relatively few participants in these programmes become entrepreneurs and start realising their ideas. Training **in** entrepreneurship is often based on a concrete idea that is realised in a more or less sharp situation. It develops the knowledge and skills that are gradually needed to develop the idea. Here, the knowledge and skills required during the development of a specific business idea are developed at different stages.

(...)

Training **for** entrepreneurship (entrepreneurial spirit) involves preparatory training to develop the attitudes, skills and approaches that generate dynamic thinking and action.

(Nutek, 2007, p. 24f; see also Dahlstedt, M. & Hertzberg, 2011)

The increasing emphasis on entrepreneurship in education since the 1990s marks a discourse shift about the role of education in the post-industrial society and consequently, the changes that need to be made in the education system (organisational, curricular, in teaching instruction, teacher training, extroversion towards the working life and the business world).

Teaching entrepreneurship strives to influence and shape a broad spectrum of the personality of each trainee. Let us consider the scope of the transformation it entails for an individual

to become more creative, more innovative, more independent, more flexible, more creative, more of everything good. Such a holistic and promising pedagogical approach equips the learner to adopt positive patterns and habits of thinking.

From a pedagogical point of view, the discourse on entrepreneurship in education shows several similarities with the movement of Progressive Pedagogy (Dewey, 1915/1990) that emerged at the beginning of the last century, the main characteristic of which is the student-centred pedagogical approach and the development of all the abilities of each student. As then progressive pedagogy, so now entrepreneurial pedagogy is promoted as a reaction to outdated pedagogical doctrines and educational practices. The words of the inspirer of progressive pedagogy John Dewey could reasonably be used to describe the idea of entrepreneurship education:

If one attempts to formulate the philosophy of education implicit in the practices of the new education, we may, I think, discover certain common principles amid the variety of progressive schools now existing. To imposition from above is opposed expression and cultivation of individuality; to external discipline is opposed free activity; to learning from texts and teachers, learning through experience; to acquisition of isolated skills and techniques by drill, is opposed acquisition of them as means of attaining ends which make direct vital appeal; to preparation for a more or less remote future is opposed making the most of the opportunities of present life; to static aims and materials is opposed acquaintance with a changing world.

(Dewey, 1938/1997, p. 19f)

ENTREPRENEURSHIP EDUCATION IN SWEDEN

From the 1980s, the need for schools to contribute to making pupils more entrepreneurial in thinking was discussed in Sweden, and a few years later entrepreneurship was introduced into the education curricula (from pre-school to adult education). Entrepreneurship in schools is understood both as a pedagogical approach in the classroom and as knowledge for entrepreneurship and self-employment (and not only for becoming a salaried worker/employee). It is about encouraging and developing all students' innate curiosity, initiative and self-confidence from an early age.

In 2009, the government adopted a Strategy for Entrepreneurship in Education aiming at making entrepreneurship run like a red thread across the whole spectrum of the education system. It is based on the belief that the foundations for developing an entrepreneurial mindset are laid from an early age, for example by stimulating girls' and boys' curiosity, creativity, confidence, and decision-making skills (Regeringskansliet, 2009). Since 2011, entrepreneurship has been included in the Swedish curricula for primary and secondary schools, but many municipalities and schools are still struggling to incorporate it into their activities.

ENTREPRENEURSHIP IN SCHOOL CURRICULA

In Lgr22 (Curriculum for the nine-year compulsory school), under the heading 'The School's Mission', there is a section where entrepreneurship is mentioned along with digitalisation,

and this concerns the overall work of the school as well as the work in the subjects:

Schools should stimulate pupils' creativity, curiosity and self-confidence, as well as their willingness to test and put ideas into action and solve problems. (...)

All students should be given the opportunity to develop their ability to use digital technology. They should also be given the opportunity to develop a critical and responsible approach to digital technology, to be able to see opportunities and understand risks and to be able to evaluate information. Education should thus provide students with the conditions to develop digital competence and an attitude that promotes entrepreneurship.

(Skolverket, 2023)

Almost the same formulations about entrepreneurship are found in the Upper secondary school curriculum (Lgr11), in the section presenting the mission of upper secondary schools, albeit more developed and adapted to the target group of secondary school students.

The school will help all pupils to develop skills and attitudes that promote **entrepreneurship**, enterprise and innovative thinking, which increase their opportunities for future employment, through entrepreneurship or employment. In an increasingly digital society, schools should also contribute to developing pupils' digital literacy. The school should contribute to students' understanding of how digitalisation affects the individual and the development of society. All pupils should

be given the opportunity to develop their ability to use digital technologies. They should also be given the opportunity to develop a critical and responsible approach to digital technologies, to be able to see opportunities and understand risks, and to evaluate information. Through these skills and attitudes linked to digital literacy, **entrepreneurship** and innovative thinking, pupils will develop skills that are important in working and social life as well as further studies.” (Lgr11)

Entrepreneurship as a learning area is mandatory for all students in both primary and secondary schools. However, this does not mean that entrepreneurship is a separate subject in primary school, but only in secondary school. The aims and objectives of the subject are presented below in a separate grid.

THE SUBJECT OF ENTREPRENEURSHIP IN THE SWEDISH UPPER SECONDARY SCHOOL

Entrepreneurship is an interdisciplinary subject. It is based on psychology and business administration but also includes other fields of knowledge such as rhetoric and law. Using concepts, theories, models and methods from these fields, the subject addresses entrepreneurship in social, scientific, cultural or economic contexts.

PURPOSE OF THE SUBJECT

The aim of teaching entrepreneurship is to develop students' knowledge of project management methods, i.e. how to initiate, design and implement goal-oriented processes. It should also lead students to develop an understanding of the importance of entrepreneurship for the development of society. It should help pupils to develop confidence in their personal resources and stimulate their creativity and willingness to take on challenges and responsibility for turning ideas into practical action.

It should enable pupils to develop knowledge of project economics or of starting and running a business and, through this, to develop knowledge of business economics. It should also enable pupils to develop knowledge of how people cooperate, communicate and solve problems in order to achieve specific goals within a context.

Entrepreneurship should be taught in the form of projects with content from other subject areas. Based on the pupils' ideas and work process, the teaching should contribute to the development of both theoretical and practical knowledge. In the context of the work process, the teaching should contribute to the development of the pupils' ability to work purposefully, solve problems, take personal responsibility and cooperate with others. Students should also be given the opportunity to reflect on their experiences in order to learn from them.

THE TEACHING OF THE SUBJECT OF ENTREPRENEURSHIP SHOULD PROVIDE STUDENTS WITH THE CONDITIONS TO DEVELOP THE FOLLOWING:

1. An understanding of what entrepreneurship means for individuals, organisations, businesses and societies
2. The ability to transform ideas into practical and purposeful activities to start a project or fictitious business
3. The ability to implement a project or run a fictitious business
4. The ability to complete and evaluate a project or fictitious business
5. Knowledge of how ideas and products are protected by laws and regulations
6. The ability to use business management methods

The entrepreneurship course covers points 1-6 above, with particular emphasis on the ability to start, carry out, complete and evaluate a project. The course covers basic skills in the subject.

NATIONAL STRATEGY ON ENTREPRENEURSHIP IN EDUCATION

In 2020, the Entrepreneurship Academy of the Royal Swedish Academy of Engineering Sciences (IVA/Ingenjörsvetenskapsakademien), in cooperation with the National Agency for Education (Skolverket), set up a working group to review the national strategy on entrepreneurship and contribute to the work on a new version. Two years later, in 2022, the working group* presented its report with an updated version of the strategy based on current and future needs. Although the report considers entrepreneurship as a key factor of development, adaptability, initiative and the ability to deal with changes and challenges, it stresses that it should not be seen only as an activity limited to starting new businesses and growing established companies:

Used correctly, it can contribute to, for example, increased ecological sustainability and positive social development. Moreover, entrepreneurship is about the ability of individuals to develop themselves. This broad understanding of entrepreneurship must also be reflected in national strategies for schools. Today, the research community almost agrees that entrepreneurship can be taught.

(IVA, 2022, p. 5)

* The working group consisted of representatives from the school world, the public authorities, the scientific community, the industry and several civil society organisations.

The report stresses the importance of the strategy for ensuring that entrepreneurship is broad and inclusive, that it is included in teacher training, and that opportunities for competence development to teachers in entrepreneurship are provided.

YOUNG ENTREPRENEURSHIP

Entrepreneurship education has been included in the Swedish educational system since the '80s, promoting cooperation between schools, businesses and other organisations dealing with entrepreneurship, of which the oldest one is "Ung Företagsamhet" (UF/Young Entrepreneurship/Junior). Ung Företagsamhet (UF) or Junior Achievement Sweden is the Swedish branch of the politically independent global non-profit educational organisation Junior Achievement (JA). While primary schools are characterised by a wide variety of activities referred to as entrepreneurship, the work in upper secondary schools is dominated by student and youth enterprises. Pupils in most upper secondary schools participate in the Young Entrepreneurship concept and run JA companies.

From the outset in 1980, UF has trained high school students in entrepreneurship through the JA Entrepreneurship programme, while since 2010 the organisation has also operated in primary schools. UF works to promote entrepreneurship among Swedish students and to facilitate relationships between industry and the Swedish school system. It gives children and young people the opportunity to train and develop their creativity, enterprise and entrepreneurship. The programmes carried out and supported by UF are designed to provide students with insight into business conditions and the driving forces of entrepreneurship. The

cornerstone of Junior Achievement Sweden philosophy is that entrepreneurship can be taught (<https://ungforetagsamhet.se/>).

JA Sweden offers three teaching curricula: *Our Community*, *It's My Business* and *Economics for Success*, reaching approximately 60.000 students yearly and aiming to secure a teaching environment that motivates pupils and teachers to learn and teach. Junior Achievement Sweden's most recognised educational programme is called UF-företagande (the Company Program). This particular programme provides high school students with the opportunity to start and run a business during an academic year. Students, with the support of teachers, and mentors from the business sector, acquire first-hand experience working with an entire life cycle of a business: including recognising an unfulfilled market need, writing a business plan, setting up their company, raising capital to produce/develop the product, marketing and selling the product and finally dismantling the business and paying any dividends. Abilities such as cooperation, solving problems, taking the initiative, reaching decisions and taking responsibility for their own training are developed in students and are useful regardless of whether, later in life, one becomes an employee or is self-employed.

Apart from the instruction, students in the entrepreneurship education programme focus on product innovation, entrepreneurship and commercial competencies by attending trade shows and participating in competitions. In the 2020/21 school year, a year marked by the COVID pandemic, 34 676 students participated in the Company Program of JA Sweden. Since 1980, more than 500 000 students have participated in JA Sweden's various educational programmes through which children and young people are given the opportunity to develop their entre-

preneurial skills. In support of the JA Company Programme, a textbook for students and a teacher's guide are available to support both the student and the teacher. JA Sweden's 24 regional offices and their employees offer motivational talks, educational seminars and activities for both students and teachers alike.

Field studies regarding the impact of entrepreneurship education and training have revealed that they can improve the participants' non-cognitive competencies such as self-efficacy, persistence, creativity, need for achievement, risk-taking propensity, analysis skills and forward-thinking behaviour and that these abilities are best developed at an early age. Those who ran a firm during their secondary schooling within the frame of the Company Programme, later had a better establishment in the labour market, fewer days of unemployment, higher income and more often become managers than the control group (Wennberg & Elert, 2012; Rosendahl Huber, Sloof & van Praag, 2012). Results from another study that investigated the long-term effects of practical exercise in entrepreneurship during high school, found that JA Sweden Alumni as a group contributed significantly better to societal welfare than comparable businesses whose founders did not attend a JA Company Programme (Wennberg, 2011).

ENTREPRENEURSHIP EDUCATION IN THE GREEK CONTEXT

In February 2020, even before the onset of the COVID-19 pandemic, the Institute for Educational Policy (IEP), a public body under the auspices of the Ministry of Education in Greece, announced a call for expressions of interest from institutions and organisations, to submit proposals for educational programmes

and educational materials to support the pilot action entitled 'Skills Workshops'. The main purpose of the action, which was later integrated into all types of kindergartens, and primary and secondary schools, was to strengthen and cultivate the so-called 21st Century Skills*, which include soft skills, life skills and technology and science skills. In the same invitation, beyond the obvious aim of strengthening the experiential and exploratory nature of learning for pupils and students, a clear reference was made to the need to train and support teachers in methodologies of a laboratory approach to their teaching work. After a pilot year, skills workshops were integrated into the national system of primary and secondary education".

One of the main elements of the skills workshops, entitled 'Create and Innovate, Creative Thinking and Initiative', included programmes in the field of entrepreneurship. This particular field of entrepreneurship education was of great interest to both pupils and teachers, since it was not limited to financial issues, but offered the opportunity for the school community to familiarise itself with various issues related to the field of enterprises and organisations, such as market research, human resources, operations and logistics, marketing and promoting ideas and many others. Skills workshops were found to be attractive to school teachers, even those with a non-financial background, as they were asked to guide their students in creating a business idea and turning it into a practical application during a school year.

* See for example: Bri Stauffer (January 10th, 2022). *What Are 21st Century Skills?* <https://www.aeseducation.com/blog/what-are-21st-century-skills>

** An analytical description of this action is presented in Greek at <http://iep.edu.gr/el/psifiako-apothesis/skill-labs>.

THE HISTORY OF ENTREPRENEURSHIP EDUCATION IN GREECE

Greece, as a member state of the European Union (EU), has committed to the introduction of entrepreneurship programmes at all levels of education, but this commitment was only made recently (Euridiki Network, 2012). Indeed, it was not until the last years, and probably as a reaction to the economic crisis Greece faced during the 2010s, that there has been progress regarding entrepreneurial education. Close to the relevant strategic goals of the EU, students are taught entrepreneurship with an emphasis placed on innovation and the creation of an entrepreneurial spirit and culture.

Specifically, in the first grade of the General and Vocational High School, students are taught entrepreneurship through the compulsory theoretical course “Political Education” (Y.A. Φ3/134083/Δ4/30-8-19). Also, the students in the first grade of Vocational High School are familiarised with dimensions and aspects of entrepreneurship through the mandatory orientation courses (Y.A. Φ3/132529/Δ4/27-8-19). Furthermore, students are even taught entrepreneurship in theoretical courses of their field and specialty, as well as in the context of laboratory courses with visits to corresponding companies (Y.A. Φ3/134083/Δ4/30-8-19).

In addition, it is worth mentioning that apprenticeship programmes are implemented in Vocational High Schools, through which apprentices attend, one day per week, laboratory courses in their specialty at the school and four days a workplace training programme—Workplace Apprenticeship (Law 4186/2013, Law 4386/2016). Apprenticeship programmes are funded by

national and EU resources and give the opportunity to young people to get insured and paid while they are trained in their subject area and develop experiential entrepreneurial skills and competencies.

Finally, entrepreneurship education also made its appearance during the last 10-15 years in the Greek tertiary education system, which had previously a rather negative perspective. Gradually, most of the almost 25 Greek universities introduced relevant courses, while the most pioneers organised incubators for start-ups (incubation centres) as well as technology transfer offices for the utilisation of research results (Doukides, 2022).

THE EDUCATIONAL PROGRAMMES OF JA GREECE

As is the case in Sweden and other countries worldwide, the youth entrepreneurship association, JA Greece, is active in Greece with entrepreneurship educational programmes, through experiential learning methods approved by the Ministry of Education. The programmes are implemented by a group of students and teachers who participate voluntarily, usually outside the regular timetable, with the aim of training students to collaborate effectively, to be problem solvers in an analytical, critical, and practical way, and to develop their creativity and innovation skills, all of which are important resources for their professional careers and their adult life.

JA Greece provides and implements several programmes at the upper secondary school level, as follows:

- The programme “My business”: Its main goal is to develop students’ understanding of business concepts, as well as

the cultivation of social skills. Through activities based on teamwork, students strengthen their critical thinking and ability to take initiative.

- The “Social Innovation Competition” programme, which takes place entirely online, is aimed at students in the third year of High School (both in General and Vocational High School). The programme focuses on promoting social entrepreneurship and pushes students to develop creative ideas to contribute to solving social problems. At the same time, it aims to cultivate necessary skills and attitudes for active citizenship.
- The “Job Shadow” programme is an interactive visit to the working environment of a company where students meet business executives, who share their knowledge and experience of the business world. Consequently, the programme also functions as a professional orientation, as it gives students the impetus to explore opportunities for professional activity.
- The “Entrepreneurial Skills Pass” (ESP) is an international certification that confirms that students have acquired the necessary knowledge and cultivated the appropriate skills to establish or work successfully in a business. The ESP is a three-year programme that is part of a European-wide campaign to promote the EU.
- Finally, a very important programme is the “Company Program”, an experiential educational programme aimed at Secondary Education students aged 15 to 18 (High School and High School). The programme is implemented under the auspices of the Ministry of Education within or outside the regular school timetable, on an optional basis,

within the innovative programmes provided in Secondary Education schools. The main objective of the “Company Programme” is to foster skills, attitudes and behaviours related to the concepts of active participation, personal development and social engagement. It educates students in innovation and entrepreneurship while activating their creative thinking, ideas and talents. Through their cooperation within a group, the students strengthen their ability to negotiate and make decisions, which may involve some risk. Finally, they compete with other groups in trade fairs and entrepreneurship competitions in Greece, but also in other European countries.

In an environment where changes happen constantly and at every level, students acquire the ability to learn continuously and to learn how to learn. It is worth mentioning that the skills they acquire are not aimed exclusively at establishing a business, but at how to effectively practice the profession they will choose in the future, being members of an inclusive society that will innovate.

ENTREPRENEURSHIP EDUCATION AND PROFESSIONAL DEVELOPMENT OF TEACHERS

Although entrepreneurial education developed very late in Greece compared to other EU countries, from the beginning it seems that emphasis was placed on the training of teachers who implement related programmes in their schools. The pilot action, undertaken by the Institute of Educational Policy in Greece, and the subsequent universal application of the Skills

Workshops demonstrated in the critical condition of the pandemic the entrepreneurial reflexes activated by the teachers, as they were called to face and manage major challenges, developing entrepreneurship skills themselves for the remote support of their students' education (Astari, 2022). This fact essentially confirms a recent report by the European Commission which argues that the entrepreneurial ability of the teachers themselves is a key element of their training (European Commission, 2020).

In Greece, research conducted by JA Greece concerning the period 2016-2021 on a population of active teachers implementing entrepreneurial educational programmes in both primary and secondary education, revealed the need for teacher training on at least three levels: a) the field of entrepreneurship itself, b) the tools and practices of educational methodology for the implementation of entrepreneurship programmes, and c) digital skills, to be able to make use of new technologies (Pavlakakis, Gerasimopoulou & Helioti, 2022). In the same survey, teachers were asked to declare their intention to receive support/training in entrepreneurship education. The majority of those who responded answered positively, regardless of whether they considered their current level of knowledge to be satisfactory or unsatisfactory. This fact demonstrates the great interest in deepening in an entrepreneurship field that creates growth prospects for them.

Indeed, another study on Primary Education highlights the positive effect that teachers' engagement with entrepreneurial education programmes has on enhancing their own knowledge level on relevant issues, as well as the moral satisfaction and reward they receive for the successes of their students (Chouliaropoulou, 2019). Even more interesting are the findings from another study in Secondary Education, from which

it appears that the participation of teachers in entrepreneurship programmes stimulates their motivation and strengthens their professional profile, giving them the opportunity to develop new practices in their teaching (Akriotou, 2020). As can be seen, teacher motivation is an important factor for teacher participation in entrepreneurship programmes and this should not always be taken for granted, as it requires a lot of time that often exceeds the school timetable, as supported by another recent study as well (Bliatza, 2019).

Similar findings are highlighted by another large study in the field of Vocational High Schools (VET) and specifically concerning the post-high school year—the year of apprenticeship. In the research, after finding significant benefits for students who participate in entrepreneurship programmes, the multi-faceted positive impact of teachers' involvement is highlighted, both in terms of the moral satisfaction they gain for the help they offer to young people starting their professional life, and in terms of their own professional development, through the development of social and professional skills from their contact with the labour market, but also from the improvement of teaching techniques and applications (Deligianni, 2020).

CONCLUDING REMARKS AND SUGGESTIONS

The present study constitutes a first attempt at a comparative approach to the issue of entrepreneurial education in Greece and Sweden, with the intention to elucidate some of its key aspects in these two national contexts.

It is important to mention that both countries' educational systems perceive entrepreneurship as a decisive educational tool

for the development of necessary skills to promote a successful future for young people by enabling them to improve both personally and professionally, along with a strong sense of civic responsibility.

Both countries integrate entrepreneurship into their national curricula, although Sweden holds a long tradition, while Greece has only recently made some progress in introducing an entrepreneurial perspective in education and training. A tentative explanation for the differences is that Sweden's education system has for several decades had a more open relationship with the surrounding society and working life than the Greek system. At the same time, Greece's membership of the EU has entailed an adaptation and harmonisation of its education policy with other member states, not least with regard to entrepreneurship, which to some extent has been accelerated by the economic crisis the country recently experienced.

Unlike Sweden, teacher training in Greece seems to have come to the fore only in recent years, on the one hand through the action of the government body (IEP) regarding the Skills' Workshops and, on the other hand, through the work of JA Greece, which provided targeted, systematic and continuous training for teachers working in primary and secondary education. In any case, it seems that teacher training programmes in Greece are aimed to equip educators with the necessary knowledge and pedagogical approaches for effective entrepreneurial education delivery.

When it comes to the volume of student participation, it is clear that students who have undergone entrepreneurial education in Sweden represent a much larger population in comparison to Greece.

However, in both countries, the notion of entrepreneurship constitutes a pedagogical innovation in line with challenges and increasing uncertainty due to accelerated changes—in the economy, society, the physical environment and culture—accompanied by unprecedented technological development and risks.

Finally, we hope that the content of this article will inspire pedagogically interested readers to see the dynamic didactic potential the entrepreneurial approach possesses and strive to design creative learning processes. We also hope that the experiences of entrepreneurship education and training programmes in Sweden and Greece may be valuable in other national contexts with similar concerns and a genuine interest in helping the growing generation (and other generations as well) to develop the necessary skills to meet the challenges of today and prepare for the future.

REFERENCES

- Akriotou, A. (2020). *The development of Innovative Business Programs to strengthen Entrepreneurship in Secondary Education*. Master Thesis. Patras: Hellenic Open University.
- Aldrich, H. E. (2012). The Emergence of Entrepreneurship as an Academic Field: A personal essay on institutional entrepreneurship. *Research Policy*, 1240-1248.
- Asteri, Th. (2022). Cultivating entrepreneurship in 21st Century Skills Workshops. In M. Pavlakis & E. Heliotis *Entrepreneurship Education: applications and good practices at School and University*. Athens: JA Greece.
- Audretsch, D. B., & Thurik, R. (2001). What's new about the new economy? Sources of growth in the managed and entrepreneurial economies. *Industrial and Corporate Change*, 10(1), 267-315. <https://doi.org/10.1093/icc/10.1.267>
- Austin, J., Stevenson, H., & Wei-Skillern, J. (2006). Social and commercial entrepreneurship: Same, different, or both? *Entrepreneurship Theory and Practice*, 30(1), 1-22. <https://doi.org/10.1111/j.1540-6520.2006.00107.x>
- Barot, H. (2015). Entrepreneurship—A Key to Success. *The International Journal of Business and Management*, Vol.3, No.1, January 2015; 163-165.

- Betts, S.C., Laud, R. & Kretinin, A. (2018). Social Entrepreneurship: A contemporary approach to solving social problems. *Global Journal of Entrepreneurship*, Vol. 2, No. 1.
- Bliatza, K. (2019). *Development of entrepreneurship skills in Secondary Education students. The contribution of Junior Achievement Greece*. Master Thesis. Patras: Hellenic Open University.
- Carayannis, E., Jones, P., Liargovas, P. & Apostolopoulos, N. (2020). Entrepreneurship and the European Union policies after 60 years of common European vision: regional and spatial perspectives. *Journal of Small Business & Entrepreneurship*, 32:6, 517-522, DOI: 10.1080/08276331.2020.1769883
- Chang, W.J., Wyszomirski, M., (2015). What is Arts Entrepreneurship? Tracking the Development of its Definition in Scholarly Journals. *Journal of Entrepreneurship in the Arts*, Vol.4, No.2, 2015; 11-31. Available from: https://www.researchgate.net/publication/343853006_Understanding_Definition_of_Entrepreneurship [accessed Oct 05 2022].
- Chouliaropoulou, A. (2019). *The contribution of entrepreneurship programs to the creation of a school as a learning community*. Master Thesis. Patras: Hellenic Open University.
- Croci, C. L., (2016). "Is Entrepreneurship a Discipline?". *Honors Theses and Capstones*. 296. Cited from <https://scholars.unh.edu/honors/296>. University of New Hampshire Scholar's Repository.
- Dahlstedt, M. & Hertzberg, F. (2011). "Den entreprenörskapande skolan. Styrning, subjektskapande och entreprenörspedagogik". [The entrepreneurial school. Governance, subjectification and entrepreneurial pedagogy]. *Pedagogisk forskning i Sverige*, 16:3, pp. 179-98.
- Dees, J. G. (1998). The meaning of "social entrepreneurship." *Stanford Social Innovation Review*, 1(1), 1-8. Available from: https://ssir.org/articles/entry/the_meaning_of_social_entrepreneurship.
- Deligianni, E. (2020). *Education and entrepreneurship: The case of the post-high school year—apprenticeship class at EPA.L*. Master Thesis. Patras: Hellenic Open University.
- Dewey, J. 1915 (1990). *The School and Society*. Chicago: University of Chicago Press.
- Dewey, J. 1938 (1997). *Experience and Education*. New York: Simon & Schuster.
- Diandra, D. & Azmy, A. (2020). Understanding Definition of Entrepreneurship. *International Journal of Management, Accounting and Economics*, Vol. 7, No. 5.
- Doukides, G. (2022). The entrepreneurship ecosystem in Greek universities: The case of the Athens University of Economics and Business. In M. Pavlakis & E. Heliotis *Entrepreneurship Education: applications and good practices at School and University*. Athens: JA Greece.
- European Commission (2019). *Key competences for lifelong learning*. (Available at <https://data.europa.eu/doi/10.2766/569540>).

- European Commission (2020). *Guide, Entrepreneurship Education. A Guide for Education*. Brussels: ECEC.
- Friedman, T. L. (2005). *The world is flat. A brief history of the globalized world in the twenty-first century*. London: Allen Lane.
- Gartner, W. B. (1988). "Who is an entrepreneur?" is the wrong question. *American Journal of Small Business*, 12(4), 11-32. <https://doi.org/10.1177/104225878801200401>
- Hennig-Thurau, T., Houston, M. B., Walsh, G., & Bode, M. (2010). The dynamic interplay of culture, resources, and strategy in international entrepreneurship. *Journal of World Business*, 45(1), 26-36. <https://doi.org/10.1016/j.jwb.2009.09.011>
- Institute for Global Research (2017). *Journal of Global Entrepreneurship*, Volume 1, Number 1. <https://www.igbr.org/journals/entrepreneurship/>
- IVA (2022). *Vi utbildar för framtiden nu. Inspel till en ny strategi för entreprenörskap i skolan*. [We educate for the future now. Input to a new strategy for entrepreneurship in schools]. Kungliga Ingenjörsvetenskapsakademien (IVA).
- Krueger, N. F. (2002). *Entrepreneurship: Critical Perspectives on Business and Management, Volume 4*. London: Routledge.
- Marx, K. & Engels, F. (1848): *Manifesto of the Communist Party*. Chapter 2. <https://www.marxists.org/archive/marx/works/1848/communist-manifesto/cho2.htm>
- Naudé, W. (2013). *Entrepreneurship and Economic Development: Theory, Evidence and Policy*. IZA Discussion Paper No. 7507, Available at SSRN: <https://ssrn.com/abstract=2314802> or <http://dx.doi.org/10.2139/ssrn.2314802>
- Nutek (2007). *Så tänds eldsjälär*. [This is how enthusiasts are ignited]. Stockholm: Nutek, p. 24.
- Lackéus, M. (2015). *Entrepreneurship in education: What, why, when, how*. OECD. https://www.google.com/url?sa=t&rcrt=j&q=&cesrc=s&source=web&cd=8&ved=2ahUKEwjOz_TjwaT_AhWLUXcKHTHGD9QQFnoECAGQAQ&url=https%3A%2F%2Fwww.oecd.org%2Fcfce%2Fleed%2FBBGP_Entrepreneurship-in-Education.pdf&usg=AOvVawowzeYGG8j4rtk1wPGcNRm
- Pavlakís, M., Gerasimopoulou, E. & Helíoti, E. (2022). The learning needs of Business Education Teachers: thoughts and suggestions for their professional development. In M. Pavlakís & E. Helíotis *Entrepreneurship Education: applications and good practices at School and University*. Athens: JA Greece.
- Rosendahl Huber, L., Sloof, R. & van Praag, M. (2012). *The Effect of Early Entrepreneurship Education: Evidence from a Randomized Field Experiment*. IZA Discussion Papers, No. 6512, Institute for the Study of Labor (IZA), Bonn, <https://nbn-resolving.de/urn:nbn:de:101:1-201208096305>
- Schumpeter, J.A. (1947). "The Creative Response in Economic History". *Journal of Economic History*. 7 (2): 149-159, <https://doi.org/10.1017%2FS0022050700054279>

- Regeringskansliet [Government Offices] (2009). *Strategi för entreprenörskap inom utbildningsområdet* [Strategy for entrepreneurship in education and training].
- Shane, S., & Venkataraman, S. (2000). The Promise of Entrepreneurship as a Field of Research. *Academy of Management Review*, 217-226. <https://doi.org/10.5465/amr.2000.2791611>
- Shepherd, D. A., & Patzelt, H. (2011). The new field of sustainable entrepreneurship: Studying entrepreneurial action linking “what is to be sustained” with “what is to be developed.” *Entrepreneurship Theory and Practice*, 35(1), 137-163. <https://doi.org/10.1111/j.1540-6520.2010.00430.x>
- Skolverket (2023). *Arbeta med entreprenörskap i grundskolan* [Working with entrepreneurship in primary schools]. Received on 17/03/2023 from <https://www.skolverket.se/skolutveckling/inspiration-och-stod-i-arbetet/stod-i-arbetet/arbete-med-entreprenorskap-i-grundskolan>
- Wagner, T. (2008). *The global Achievement Gap: Why even our best schools don't teach the new survival skills our children need—and what we can do about it*. New York: Basic Books.
- Wennberg, K. & Elert, N. (2012). *The Effects of Education and Training in Entrepreneurship—A long-term study of JA Sweden Alumni labour potential and business enterprise*.
- Wennberg, K. (2011). *Practice Makes Perfect? A Longitudinal Investigation of Junior Achievement (JA) Sweden Alumni and Their Entrepreneurial Careers, 1990-2007*. Center for Entrepreneurship and Business Creation at Stockholm School of Economics.
- World Bank. (2020). *SMEs (small and medium enterprises) finance*. Received on 17/03/2023 from <https://www.worldbank.org/en/topic/sme/finance>.

Navigating the Road Less Traveled to Computer Science: Exploratory Perspectives from Male and Female Undergraduate Students

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ABSTRACT

The study goal was to explore the shared perspectives of undergraduate students on the experiences and factors mediating their decision to a computer science (CS) pathway and sort out differences in related insight. A multi-case study approach was used to conduct the exploratory research, drawing from the experiences, perspectives, and voices of a small group of undergraduate students, including male and female representation. Derived from thematic analysis and using literature on boosting and broadening participation in CS and Social Cognitive Career Theory premises as a frame of reference, the findings largely supported the role of family influences, the impact of environmental support in the secondary education pipeline, and the contribution of intrinsic motivation and self-determination for pursuing undergraduate studies in CS. Observed differences also aligned with related literature, while in other cases, related deviations may have been a function of the small group of participants in the study. Two crucial mediating factors for interest

development and career readiness were absent from the participants' accounts, both related to environmental supports in secondary education, with no mention of any impactful support from school counselors and the role of vocational educational programs as participants primarily engaged in academic tracks. While the findings are agreeable, they represent the perspectives of a small pool of students with limited representation of gender and race/ethnicity. Further research is warranted with a more robust inclusion of participants from underrepresented backgrounds in CS.

KEYWORDS

Education in the United States, computer science participation, STEM education, career decision-making factors, vocational interest

INTRODUCTION

The Science, Technology, Engineering, and Mathematics (STEM) movement continued to grow dramatically over the past two decades due to the rising global demand and shortages of qualified workers (Schmidt & Shumow, 2012; Spellings, 2006; U.S. Bureau of Labor Statistics [BLS], 2020; Wang, 2013a). The STEM demand in the United States (US) has been notably high, with growth predictions of 8.8% in related fields through 2028 compared to 5.0% for non-STEM occupations (BLS, 2020). The demand and supply of qualified workers in STEM fields in the US also revealed a lack of diversity and prompted a call to boost the participation of underrepre-

sented groups in the education pipeline (Almarode et al., 2014; National Science Foundation [NSF], 2018).

Computer science (CS) is at the core of the STEM movement and is recognized as one of the fastest-growing disciplines where the need for workers has represented one of the largest shares in the STEM-related demand (Code.org, 2020; Fayer et al., 2017; Schmidt & Shumow, 2012; Spellings, 2006). Unsurprisingly, given the relatively recent emergence of the discipline, coupled with strong math preparation, and negative stereotyping, issues with diversity have been even more pronounced in the CS workforce and education pipeline. The gross mismatch in demand and the lack of diversity in the talent supply resulted in stronger calls for promoting the participation of underrepresented students in CS (Code.org, 2020). This call has been particularly pointed regarding the need for increased participation of women in undergraduate education as the main feeder of talent. For example, in 2017-18, only 15,894 females completed a bachelor's degree in computer and information science out of 79,598 total degrees conferred (National Center for Education Statistics, 2019), while in the workplace, only a quarter of women are reported as computer or math scientists (Sullivan & Bers, 2017). The lack of diversity in CS has been so drastic that this topic has gained national popular culture attention in recent years in the US (Chang, 2018a, 2018b; Davis, 2017; Frieze & Quesenberry, 2020; Ratcliffe, 2015).

To better understand the reasons behind the lack of diversity in CS, researchers have examined factors such as exposure and access to CS undergraduate coursework, social pressures and perceptions (who “fits” the career stereotype), classroom environments and barriers, and an individual's psychology (Alex-

ander et al., 2011; Fouad & Santana, 2017; Hill et al., 2010), as well as cultural and gender influences (Frieze & Quesenberry, 2020). However, it has been suggested that further research should address how interest and decision to enroll in a CS pathway either retrospectively or by exploring the experiences of students in secondary education (Sullivan & Bers, 2017). In this respect, while there is research on the participation and experiences of female students in CS, there is limited research focusing on a comparative analysis of experiences and perspectives based on factors that shaped interest in CS leading to undergraduate enrollment. A comparative analysis of retrospective perspectives is important to account for similarities and differences as students navigate interest development and postsecondary enrollment decisions.

Against this backdrop, the purpose of the study was to explore the shared perspectives of undergraduate students on their experiences and factors mediating their decision to seek enrollment in CS. A complementary goal was to sort out differences in students' perspectives as they navigated their decision-making for pursuing a CS pathway. This study was driven by a major research question: What experience or factors contributed to pursuing a college pathway in CS? The exploratory study drew from the experiences, perspectives, and voices of a small group of undergraduate students, including male and female representation.

CONCEPTUAL LITERATURE AND FRAMEWORK

The conceptual framework for this study was grounded in the literature related to factors for boosting participation in CS and

the premises of the Social Cognitive Career Theory (SCCT). The literature review and SCCT theoretical underpinnings served as the conceptual framework for this study and for the interpretation of the findings.

BROADENING PARTICIPATION IN COMPUTER SCIENCE

The importance of the STEM movement has been widely recognized as related competencies and skills are fundamental to continued economic growth and competitiveness in the global economy (Schmidt & Shumow, 2012; Wang, 2013b). In the US, an 8% increase in STEM jobs is expected through 2028, faster than growth projections for all occupations during the same period. Most STEM jobs require a bachelor's degree for entry-level employment, but while many students enroll in STEM majors, retention and completion of programs vary greatly, with the enrollment levels of female students as a cause for concern (Almarode et al., 2014; NSF, 2018; BLS, 2020).

As part of the STEM movement, CS has expanded and grown significantly as a discipline, but the shortage of qualified workers has been even more acute (Brown, 2015; Fayer et al., 2017; Scarpelli et al., 2017). Considering this trend, the need for computer scientists, along with the need to educate, attract, and maintain interest in CS, became increasingly evident (Aderoju, 2016; Cobo, 2019; Computer Research Association, 2015). However, the need to boost participation in CS is compounded by the historically low representation of minorities in the education pipeline (Schmidt & Shumow, 2012). To wit, over the past decade, only 25.1% of STEM workers were female, and of all STEM

workers (male and female), 70.6% were white, 16% were Asian, 6.3% were Black or African American, and 7% were Hispanic; as evidence of underrepresentation of females, African Americans, and Hispanics (Martinez & Gayfield, 2019). For further evidence, in CS, women represent a lingering minority in the field, making up less than 25% of the engineering and CS population (Schmidt & Shumow, 2012) and earning 27% of the bachelor's degrees in mathematics and CS (Wang & Degol, 2013).

To boost and broaden participation in CS, researchers and policymakers have explored intervening factors such as exposure, access, social pressures, work perceptions, classroom environments and barriers, and individual psychological factors (Alexander et al., 2011; Fouad & Santana, 2017; Hill et al., 2010). From related literature, we have learned that children of color, low-income students, and girls are the most common groups that miss opportunities to participate in CS, often due to limited access or select encouragement towards CS education in their schools (Corbin, 2016). We also know that early exposure to related pathways is an essential component of increased interest and post-high school enrollment in CS programs (Hill et al., 2010). The problem is that exposure and access to CS in secondary education varies greatly in the US. While CS preparatory education is often limited to computational thinking and mathematics preparation, some schools offer additional courses such as programming, application development, games, or website design. These issues, along with the lack of qualified CS teachers at the K-12 level, complicate the efforts to boost and broaden related participation (Alba, 2016; Google & Gallup, 2016).

Recent reports have noted that 74% of girls in middle school show an interest in STEM (including CS), but only 9% of high

schools offer courses in advanced placement CS, and concerning only 0.4% of young women declare CS as their undergraduate major (Aderoju, 2016; Zehner, 2016). As girls and young women navigate their education, they encounter gender roles and stereotyping, preventing interest development in CS along the way. Such stereotyping associated with gender and career pursuits is reported to be developed at an early age and may be reinforced through conscious or unconscious bias in school by teachers, parents, and others (Boston & Cimpian, 2018). Further, gender stereotypes in American culture are pervasive and contribute to the reproduction of biases and prejudices that can shape the career interests and choices of young women (Deemer et al., 2014). As such, even when joining a CS pathway, many women report challenges in social pressure and ‘fitting in’ (Hill et al., 2010). Thus, some of the issues limiting interest and pursuit of a CS track in school are related to individual identity, experiences, and environmental influences (Frieze & Quesenberry, 2020).

SOCIAL COGNITIVE CAREER THEORY

As posited by Lent et al. (2000), people develop and pursue interests in activities that they see themselves as successful in, and that have positive future outcomes for themselves because of pursuing the activity. This is the basic premise of the Social Cognitive Career Theory (SCCT), which aligned with the focus of this study under the assumption that students pursuing CS see themselves as competent in that discipline and envision a future career in the field building upon related knowledge and skills. Researchers have demonstrated that SCCT can be used to

explore students' CS choice behaviors in educational pathways (Fouad & Santana, 2017). SCCT takes into consideration multiple mediating factors contributing to stronger relevant connections for a student's educational pathway choice (Wang, 2013a). The mediating factors include individual characteristics, family influences, structural academic barriers, social perceptions, and psychological factors. These factors can be grouped into three categories so that a person's educational pathways of career interests and pursuits can be explored and better understood drawing from personal background (individual experiences, home influences), academic experiences (opportunities and limitations to develop interest in CS in schools), and psychological factors such as attitudes and motivation (Fouad & Santana, 2017). This regrouping aligns with overlapping connections among the individual, the environment, and behavioral predispositions, and often interplay with one another to influence an individual's choices (Ryan & Deci, 2000; Tademey & Clark, 2008).

Individual characteristics, such as a person's socioeconomic status, race, and other demographics, are known to impact a person's perceptions of fitting in and exposure and visibility into seeing others 'like them' in areas of interest (Fouad & Santana, 2017; Lent et al., 2000). Correspondingly, family factors refer to impacts regarding gender roles, self-concept, and support from family members in the crucial formative middle and high school years when students make decisions on academic pursuits and career paths (Fouad & Santana, 2017; Garriott et al., 2017). In this respect, it has been suggested that more educated parents may have less conventional gender and career beliefs and stereotypes, which in turn may provide the support structure for girls to pursue careers in CS. Moreover, structural academic bar-

riers (and opportunities) in school years are crucial to career and interest development and may include social, academic, or financial considerations (Wang, 2013b). To be sure, the middle and high school years are influential times in students' development of interests as they navigate personal, family, and environmental factors (Fouad & Santana, 2017; Wang, 2013a).

Psychological factors such as attitude, motivation, self-efficacy, stereotype threat, outcome expectancy, and sense of belonging are also impactful in a person's pursuit of academics and career choice (Fouad & Santana, 2017; Tinto, 2017). Related literature has suggested that females match male interest in CS in middle grades, but it decreases as they move up in school, perhaps impacted by social expectations and a sense of self-efficacy (Hill et al., 2010). In addition, it has been noted that boys and girls look toward their future differently by taking stock of their strengths, abilities, and interests to choose a pathway that they believe best maximizes their utility value (Gnilka & Novakovic, 2017; Wang and Degol, 2013). This sense of efficacy is about a person's confidence and belief in the ability to accomplish a task or behavior (Bandura, 1997). For college students, self-efficacy has been reported as the strongest direct predictor of academic success and persistence regardless of gender or race/ethnicity (Fouad & Santana, 2017). Accordingly, students are more likely to exhibit greater self-determination to pursue a particular career path based on their sense of competency, autonomy, and relatedness (Niemic & Ryan, 2009; Ryan & Deci, 2000; Ryan & Deci, 2002).

With this frame of reference, drawing from literature on boosting and broadening participation in CS and SCCT premises, we confirmed the relevance of exploring the perspectives

of undergraduate students on their experiences and factors that contribute to their interest and enrollment in CS. Specifically, we conceptualized that students may have had different experiences and influences at home and in the secondary education pipeline, which shaped their motivation and self-determination for pursuing undergraduate studies in CS.

METHODS

A multi-case study approach was used to conduct the research. Case studies represent an appropriate method for documenting and understanding phenomena of interest associated with settings and individuals (Elman et al., 2016; Gustafsson, 2017; Stake, 1995). Case studies are often used in research to help bring the voices of the human experience in a variety of settings the approach is suited to the study of educational pathways as recounted by men and women (Gustafsson, 2017; Stake, 1995). The case study design was complemented with the use of interpretivism, which allows for the exploration of individuals' perspectives, interpretations, and sense-making with respect to their experiences, environment, and culture. A key component of interpretivism research is the participant-researcher connection, as well as the appreciation of differences in experience between individuals in the development of meaning-making (Elman et al., 2016; Grbich, 2013).

PARTICIPANTS

The target population for this study was CS undergraduate students enrolled in a major university in the Southern region of

the United States. The university serves more than 50,000 students total and almost 40,000 undergraduates (43% male, 57% female) and boasts a diverse student population in gender, ethnicity, and international representation. Within the university, the targeted study population was affiliated with the College of Engineering, with a combined enrollment of 1,049 students in CS and engineering. For the intent of this study, depth in individual experience was explored, limiting the population to the selected university's undergraduate students who were at least 18 years of age, had completed at least two undergraduate, or equivalent, CS courses in their end of Junior, beginning of Senior year, and had a declared minor or major in CS. Higher-level students were targeted because they are set on their CS pathway, and transferring to other programs is less likely to occur. Under these criteria, the eligible target population was reduced to about 400 students who were predominantly White (45%), followed by Hispanic (22%), Asian (17%), Black (17%), and with the representation of females reported at 25 percent.

Given the small number of students enrolled in CS and the stringent requirements for recruitment, a minimum of four students, including two males and two females, were sought as participants in the study, a number appropriate for case study research (Baker & Edwards, 2012). Students were recruited using purposive sampling and a modified snowball technique from the junior and senior classes (Kara, 2017). Purposive sampling enables the researcher to selectively pick the sample based on the participant's likelihood of contribution to the research (Kara, 2017). However, because recruitment was conducted at the height of the COVID-19 pandemic, only three students volunteered to participate in the study including one female and two males. The pool of participants met the general criterion for

gender and minority representation, with two of them identified as Caucasian and the other as Asian. The small number of participants was commensurate with case study research, which allows researchers to obtain a deeper perspective of each participant and their individual histories (Ashford, 2016; Baker & Edwards, 2012; Stake, 1995). In this multi-case study, the small number of participants allowed for rich data collection from each participant, for deep exploration of their pathways and experiences, as well as for stitching together common themes between them.

INSTRUMENTATION AND DATA COLLECTION

Interview protocols were developed drawing from the conceptual framework to ask retrospective questions on the experiences and factors mediating the interest and enrollment on a CS pathway. A journaling activity was also planned for data collection to help participants reflect and outline their perspectives on their educational journey with the use of prompts. To refine interview protocols, a pilot study of the questions for the interviews and reflective journaling prompts with two participants, one male, and one female, was conducted. Based on the pilot results, a refinement of the interview protocols and data collection was implemented to enhance the quality of data during the implementation phase. The study plan received Institutional Review Board approval to ensure that standards for the inclusion of human subjects in the research study were met.

Once selected, each participant completed a demographic questionnaire and formally agreed to be interviewed and complete journaling activities. The first interview used a timeline

approach to help participants process their accounts in chronological fashion using major stages of development and education for reference. During the first interview, participants were asked to identify the major milestones in their CS educational pathway, with follow-up questions elicited around key events for clarification and elaboration. Two additional interviews were conducted subsequently to confirm and validate findings for each participant. One week after each interview, a transcription copy was emailed to the participants for their review. Participants also agreed to maintain a journal to reflect on their educational pathways in their CS courses at least three times during a semester, in intervals of four weeks. The nature of the reflections and the corresponding topics of interest were discussed with the participants at the beginning of each data collection point to ensure a common understanding of the prompts and writing expectations. Overall, participants took part in three interviews and three journal reflections throughout an academic semester. Participants received a gift card at the completion of each stage of data collection during the study, for a total of \$50, in appreciation for their participation.

ANALYSIS

The analysis of the multi-case study was conducted considering each participant as an individual case and identifying underlying themes across cases. Following this approach, each participant's narrative was used to explore their educational pathway, shared impacting factors, as well as differences across the group (Janesick, 2016; Kara, 2017, Stake, 1995). Specifically, we used a thematic analysis of the narrative drawing from the participants' accounts and journaling reflections to identify themes from

individual and collective cases. For interview data, we began identifying themes within the data through the categorization of like-experiences and reflections (Grbich, 2013; Kara, 2017). Categorical tidbits were placed on coded electronic “cards” for each major category and assigned a bucket. Upon completion of each transcription analysis, a review of the “cards” within each bucket (individual and as a group) was conducted. The intent of the categorization and bucketing was to allow for the identification of common groupings and themes and for flexibility in narrowing them further through ensuing coding and categorization (Kara, 2017). Similarly, journal entries were thematically analyzed within each case and across all cases, using the same coding process for the interviews. This categorization and bucketing process allowed for the identification of themes within and across cases and the determination of commonalities and differences in the participants’ perspectives (Kara, 2017).

For the total analysis, we intentionally used an interpretivism lens for the analysis of single cases and cross-examination of the multiple cases to keep close to the individuals’ voices and perspectives on their experiences (Grbich, 2013; Janesick, 2016). In addition, we also used data triangulation by cross-referencing cases, double-checking journal entries and interview data, and confirming themes with participants for verification (Janesick, 2016; Kara, 2017).

FINDINGS

Based on the total analysis across cases, we first report our findings on shared themes regarding factors that made a difference in developing interest and pursuing a CS pathway. We then high-

light some critical differences in experiences and perspectives based on the participants' backgrounds. To set the context for the findings, we start with a brief introduction of the participants to acquaint the reader with their family background, general upbringing, current education status, and work pursuits.

PARTICIPANTS:

GRACE, JAMES, AND NIKOLA

Grace is a White female in her early 20s. She is the youngest of three children in a military family and is an aunt to five nieces and nephews. After the early military moves in her life, Grace's family settled so that she was able to attend middle school, high school, and now university in the same city. Grace shared that her family is very close-knit and supportive. Her mom, through our conversations, seemed to be the glue for the family, helping to form, shape, support, and discipline the children and maintain the household. She also encouraged and supported the family in civic engagement. Reflecting on her time in the CS classroom, Grace shared that she was often one of the few females in her classrooms, which suited her as she was a self-proclaimed 'tomboy.' In middle school and high school, she took many CS and technology-related courses, and during her time in college, she has interned with a small cyber firm engaging in cyber security and social engineering work. Grace was in the last semester of her undergraduate studies in Cyber Science when she participated in this study.

James is a White male. He is 27 years old and the youngest of three boys who was born and raised in the Southeast. He reported being an average child with a love of the outdoors who enjoyed building things and doing well in school, although he

was stronger in subjects where he had more interest than others. James shared that he had a predominantly suburban middle-class childhood and a family that was, and still is, very close-knit. His middle brother introduced him to CS, and they both developed varied interests within the CS world and used to get together to hang out or play video games. James joined the military after high school, following a short stint at a community college. He started off his military enlistment pursuing a career track that was of interest to him, but when he became ill in training, he had to withdraw. After his injury, James found himself in another career track related to CS, where he thrived and honed his problem-solving skills. He participated in the study in his final year of undergraduate studies, and upon graduation, he went to work in the Midwest for a large global aerospace company.

Nikola is an Asian male who is also in his early 20s. During his childhood, from birth through the end of middle school, he lived with family in Asia. His father died when he was 12 years old, and this event greatly impacted him. Because his father was his only parent in Asia, after his death, he needed to move around from family member to family member. He finally settled in his maternal grandparents' house towards the end of middle school, giving him stability in his home life and the opportunity to focus on living a relatively normal childhood. He immigrated to the US for high school and had to adjust to the cultural and social environment as well as learning a new language. Nikola survived secondary education in the US and wants to change the world using CS to build better ways of doing things. He was a senior at the university when participating in the study, majoring in Computer Science and Engineering, and looking to graduation the following semester.

NAVIGATING THE ROAD LESS TRAVELED TO COMPUTER SCIENCE

The exploratory analysis of the participants' perspectives on their educational journey resulted in the identification of three themes pointing to the role of family models, the impact of supportive teachers, and the cruciality of intrinsic interest in pursuing a path in CS.

IMPORTANCE OF FAMILY ROLE MODELS

All three participants reported having a strong connection with at least one supportive person in their family regarding CS and technology. These role models helped them develop interest and/or stoke the fire of curiosity in CS in each case by providing relevant connections and a nurturing environment that fostered their motivation to learn more about related applications and potential pathways for success. All three participants shared how a close relative impacted their awareness and interest in CS. Grace's grandfather, father, and brother all showed her how CS worked and encouraged her in her informal activities (i.e., fixing family phones and computers) and formal pursuit of CS. In this respect, she noted that she "really wanted to go into tech because all of the guys in [her] family were interested in technology." James shared a similar story. His interest developed seeing his middle brother 'playing' with his computer, and when he began to show him how coding worked, the 'ah-ha' moment happened for him. As James recounted:

I just liked playing around with coding and showing him some cool ideas that I was coming up with, and I thought was really cool. And it was just kind of a little joint venture between me and him and nothing too super serious. It was kind of fun playing around with the software. He showed me how to code and got me into really coding and so I dived in the software and was like, oh, wow, look at all this. So, it was just me and him playing around with it, doing cool things.

For Nikola, it was primarily his grandfather who played a role in developing an interest in building things and seeing how the code works. When he was living with his grandparents, his grandfather and his cousin took Nikola to a computer store to have his first computer built. The experience was mesmerizing for Nikola, and he spent hours exploring how computers work. That is how his interest in CS got started.

Grace, James, and Nikola each described the impacts of a family role model on their individual pathways to undergraduate CS education. Grace recounted how being part of the ‘guys’ and sharing tech with her father fostered her passion and interest, while James shared how his middle brother let him see the excitement of coding through a joint-built game. Further, Nikola shared how the love and support of his grandfather after a life-changing event enabled him to have the safety and security to focus on school and his newfound interest in computers. Based on their retrospective narratives, it was evident that family role models were important mediators for each participant as they explored and developed an interest in CS.

IMPACT OF SUPPORTIVE TEACHERS

The role of supportive teachers was another common theme shared by all participants. Nurturing teachers were singled out for inspiring and engaging participants with activities and resources to encourage and foster their interest in CS. These inspiring teachers were noted for going out of their way beyond classroom instruction serving as a sounding board for participants and pointing them in the right direction when they had questions. Each participant relayed stories of good teachers who made lasting impacts in their lives, positively impacted their educational journey, and enabled the potential pursuit of CS.

Grace offered support for this narrative by indicating that her experiences in CS and technology classes were really cemented by the teachers she was exposed to. She remembered always wanting to take a technology course and having the first opportunity to do so in 8th grade. Her memories of that class, Communications Technology, and the teacher are warm, as she recalled fondly:

I took Communication Technology, and it was my favorite course. The teacher was a gentleman probably in his later 60s who had had a very full and exciting life. He always had weird little tips and tricks for all of us. That class in [middle school] led to me taking the level 2 course in high school. It was another great class, although the structure and course material were wildly different from my level one class. This professor was another great man with lots of life experience and a wildly different approach to teaching... I definitely got to see how

things in the digital world could transfer to the physical one. And I had professors continuously, who believed me when I would say stuff.

James provided further support on the important role of teachers. He was struggling with mathematics in middle school, and it was his track coach who took it upon himself to help him. Since math is fundamental to competence in CS, James fully recognized how school staff can make a difference in someone's life. The deep appreciation he has for that support is evident in his following remark:

I think having someone as a mentor and having someone you come across who cares about you can change you. All of a sudden, my grades in math changed. I think he was the reason. He literally stood in the middle of my road, my journey, and he was like you're going to stop and going to learn this. And if he didn't do that, I don't think I would have had as good of math fundamentals as I do today.

Likewise, Nikola had a supportive school experience when he moved to the US. His teachers supported him when he claimed to know the content material, jumping almost three grades in his math courses, from Algebra I to Pre-Calc, in his first year in the US. This trend continued with teachers supporting Nikola when he expressed interest in higher-level AP courses. In all, Grace, James, and Nikola provided consistent accounts of the supportive role of teachers and staff in secondary education. All of them reported teachers who positively impacted their lives and helped make a difference in their interest, understanding, and pursuit of a CS pathway leading to undergraduate studies.

CRUCIALITY OF INTRINSIC INTEREST:

"YOU HAVE TO WANT IT"

All participants referred to the critical role of having a strong sense of passion and desire for their engagement in CS. They noted that these feelings are crucial to building competency, ensuring success, and being able to push through the road less traveled to CS. Grace verbalized the "You have to want it," perspective through her strong and genuine passion behind her desire to be in the CS educational and career pathway. Grace knew since she was younger that she loved technology, and her passion for the field only grew stronger as she continued to learn more, leading to enrollment in CS at the university. She now sees how CS and technology have wound their way throughout her life and have become a part of almost everything she loves doing. Nikola further reinforced this storyline on the role of intrinsic interest as a source of motivation for academic success. He recalled his mother encouraging him to pursue medicine as a career, but he knew that he would be most successful at something he had a passion for, which was more on the technical side of STEM and closely aligned with CS. For him, having a passion for something is essential, as he remarked:

I think you need to pursue your interest to be successful down the road. Even though the field pays well, that doesn't mean you will earn a lot because if you are not passionate or interested in it, you may not perform well at it. So, if your heart is not in it, you will not perform as well as those who are passionate. I feel like that is the reason.

James found his passion and interest after postsecondary education while serving in the military for about seven years and after having that ‘light go on’ for him about how cool CS could be. It is the underlying passion for CS the reason he feels connected to the CS community, the motivation for pursuing a related degree, and the enjoyment he is getting on his first job. In all, participants pointed to the important role of intrinsic passion and interest in CS that develop over time and the contribution of supporting individuals at home and in schools.

DIFFERENT VIEWS AND EXPERIENCES

There were two areas where participants had somewhat different retrospective views. One theme was related to the role of gender and the impact on their educational journey. The other theme related to the contribution of different work-based experiences to their interest development and pursuit of a career pathway in CS.

AWARENESS OF GENDER DIFFERENCES IN PARTICIPATION

Both Grace and James discussed their experiences and perspectives on the role of gender in CS. Grace, as a minority within her field, was fully aware of her gender and how it could sometimes impact or be a point of differentiation in the field and amongst her peers. Grace, as a minority in the CS field, sometimes felt conflicted about being more comfortable around boys and having feelings of imposter syndrome at the same time. She shared that she did not really notice it much in middle school, but as she got older and into more classes, it was something she real-

ized. In many cases, she feels like her classmates and teachers treated her like just another student, but she had those instances where she felt like she had been treated like a “girl” in a sub-par way to her male counterparts. In this respect, she elaborated on how being a minority in CS made her have imposter syndrome feelings sometimes:

It’s just that tech [CS] seems to be a field that more guys go into, the same for engineering. You see a whole bunch of guys in the engineering department, and you see a couple of girls spotted around here and there. And so, you kind of just get used to it. Like I didn’t realize how used to it I was until I had a business class for my major with a whole bunch of girls, and I had that culture shock like we talked about.

Grace also recounted being bothered because she was more comfortable with the boys and feeling as if she was a gender traitor to females in CS and tech. On the one hand, she was fully aware of the very limited representation of women in CS and the additional burden it implies for those in a pathway dominated by men. On the other hand, she also mused about how that sometimes makes her think differently about herself and other girls. For example, she agrees with the idea that admission criteria should be relaxed to boost the participation of women but realizes many of her female peers feel it would be a disservice to gender equality for the sake of raising enrollment. She also feels a bit guilty sometimes, thinking about whether the jobs she gets in the future will be because of her gender or because of her skills and capabilities.

From James’ perspective, being a male and having come from the military, gender was not a factor in job assignments or pro-

motions. He felt people are rewarded because of their performance based on test scores or other measures. He did not see a difference in a male or a female coder and mentioned how he has had these views for a while. He elaborated as follows:

I don't see a difference. I mean, there are some really gun-ho females that are really good coders, and they're very logical, and I see males that are super logical as well. What I've witnessed is a lot of people coming together and helping each other out. In my experience in college, like this is our core group specifically, there are two females and two males, and we help each other out. And there were even cultural differences. So, I view it really positively, I think that it is great to bring different perspectives or ideas from different people to different situations. I think that whoever can do the job should do it. I don't think that there's really any difference.

The gender narratives from Grace and James revealed an alignment with the current lines in the gender conversation. While women articulate feelings of loneliness and conflictive allegiances with female peers in a predominately male environment, men can speak from the vantage point of dominance where equity issues are invisible.

DIFFERENT WORK EXPERIENCE, DIFFERENT OUTLOOK

Lastly, all three participants had different work-based experiences, including unpaid and paid activities. Drawing from those experiences, participants articulated the shared impact on their career readiness and different perspectives on their employment

outlook. In this regard, Grace's work-based experiences through college were mostly in the form of volunteering activities and part-time menial jobs at places like the local grocery store and a holiday store. Her volunteering activities were conducted in the community, as part of church work, and as a member of the Girl Scouts. As she completes college, she is doing an internship at a small cybersecurity firm. In retrospect, she realized that although volunteer work and other odd jobs helped her develop soft skills, she wished she had had broader exposure to work in real-world settings like her current internship. She believes the latter would have been more beneficial for developing both technical and soft skills for transfer to her success with future employment. Based on her work-based experience, her outlook is to start working for a smaller company to hone her work readiness and move afterward to a larger company.

In contrast, James had a robust work record in a large organization with a very regimented structure and care for competence and performance. He served in the military for nearly seven years before returning to university, which he attended using the GI Bill. He believes that his choice and experience working for the military will serve him well after graduation from college by landing a job as a defense contractor. Since he already had work experience in the field, he decided to focus his stay in college on being successful academically. However, to stay busy, he had a few jobs, like lifeguarding and working at a local store because working is something he enjoys doing, and part-time employment did not impact his studies. He also felt confident that he could quit a part-time job in case he needed the time for his educational commitments. James made it abundantly clear that "working was something that was important to [him] while

in school, but school [was his] priority.” Upon graduation from college, his plan was to move to a new city to start his first job, and he was excited to build upon his military experience, his education, and his love of CS in his new role. He felt his work experience with the military gave him an edge in terms of work readiness and career mobility.

In Nikola’s case, his work-related experience consisted primarily of academic volunteering activities in high school and at the university. Because of his strong background in mathematics, most of his volunteering centered around STEM programs doing student tutoring, helping teach kids how to develop creativity and solve problems, and serving as a teaching assistant while on a study abroad. In addition, he has volunteered in the past at a local animal shelter, acting as the manager to process cat adoptions. Reflecting on his volunteer work, he deems the skills he has gained through such activities as helpful in his search for future internships or full-time employment post-graduation. He also shared that he knows soft skills are very important, particularly presentation and communication skills, both of which he continued to refine through his volunteerism and academic engagement in college. For Nikola, his short-term outlook was finding an internship as he approached graduation during the pandemic. In the long run, like Grace, he plans to pursue employment in CS with small companies in video game development or in cybersecurity with financial organizations and then move to a larger company like Google, Apple, Chase, or Wells Fargo.

The role of work-based experiences hinted at the benefits of having real-world exposure and understanding of the field when recorded in the same area of interest as in the case of James. His

prior work experience in the military allowed him to focus on his undergraduate studies and expand his employment outlook upon graduation. While the employment outlook for Grace and Nikola is bright, their work readiness relied on a variety of odd jobs and/or volunteer work to develop some basic employability skills. In accordance, their plan to start working for small companies speaks to their awareness of the need to hone work skills before moving to larger and more competitive companies.

DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

The exploratory analysis of students' perspectives on their career path interests in CS largely aligned with related literature and SCCT premises regarding the mediating contribution of personal, family, and environmental factors on educational choice (Alexander et al., 2011; Fouad & Santana, 2017; Wang, 2013a). In our study, the role of personal factors associated with intrinsic motivation and vocational interest was identified by all participants as a requirement for pursuing an educational pathway in CS. Related factors have been consistently regarded in the literature as impactful in a person's pursuit of academics and career choice (Fouad & Santana, 2017; Tinto, 2017). As recounted by participants, given the need for a strong academic background in mathematics and problem-solving, an underlying passion for CS is critical for interest development and persistence in the field. The challenging nature of CS-related coursework, while serving as a deterrent for other students, might be seen as an opportunity for further learning and growth for those with high math ability, fueling further interest in the discipline (Almarode et al.,

2014). Thus, having the right mindset and passion for CS-related learning and work was seen as a common intrinsic requirement (Wang, 2013b; Wang & Degol, 2013). This single-mindedness contributes perhaps to a strong sense of belonging in the CS community, also mentioned by participants and a point that is often relayed in the literature (Hill et al., 2010; Niemiec & Ryan, 2009; Pollack, 2015). In all, participants had a consensus in acknowledging a common desire and commitment to pursuing a career in CS out of passion for related work. They were all clear that one must want to be part of CS as an internal drive and as the primary source of interest and success in the field. For exemplification, Grace's sister, had the exact same home environment and upbringing but had absolutely no interest in CS.

Further, the contribution of family influences was very important for participants in their early years and throughout their lives in terms of general support from relatives. This finding is confirmed by related research noting that family members contribute to students' academic motivation, achievement, and educational and career interests through a variety of nurturing supports (Alexander et al., 2011; Savoca et al., 2023; Wang & Degol, 2013). In this respect, each of the participants reported related support and influence in their interest development and pursuit of CS as a career pathway. Moreover, while parental influence is often strongly associated with the maternal side of a family (Fouad & Santana, 2017; Wang, 2013a), for the participants in our study, it was mostly male relatives who were recognized for their impactful support. However, this could have been a function of the small number of participants in the study.

Regarding the impact of environmental factors during their educational journey, none of the participants reported anything

remarkable for early education/elementary school. This conflicts with some research that suggests early/elementary school and exposure are important (Fouad & Santana, 2017; Savoca et al., 2023; Wang, 2013b). For participants, their middle and high school years were more impactful in terms of exposure to and interest development in CS, which corresponds with related research confirming the importance of that schooling period (Almarode et al., 2014; Hill et al., 2010). It is during the period of secondary education that students start to explore their interests and take courses that set the foundation for future educational and career pursuits (Fouad & Santana, 2017; Wang, 2013b). Not surprisingly, all three participants noted the important role of the middle and high school environments and the support they were afforded during those years. Specifically, they all highlighted the critical role of supportive teachers in their educational journey.

In terms of differences, we observed two major areas where participants had somewhat divergent retrospective views or experiences. One area where views differed was related to the role of gender and the impact on participation in CS. While the only female in the study was fully aware of gender issues and the experience of women as a minority in CS, male counterparts did not see any gender differences and claimed to focus on ability and performance only. This is consistent with related literature regarding the experience of women in male-dominated pathways and fields as lonely and challenging, while men's views are often depicted as oblivious to gender issues in STEM-related education and workforce (Chang, 2018a; Deemer et al., 2014; Frieze & Quesenberry, 2020; Hill et al., 2010). Similarly, participants had different work-based experiences to help them

develop employability skills and career readiness in CS. One of the participants had work-based experience relying on volunteerism and menial jobs, while another had participated mostly in related activities in academic settings, such as tutoring and student coaching. Only one had a robust record of work experience doing work related to CS, and this difference showed in the way they viewed their future employment outlook. All acknowledged the benefit of work experience on employability skills, but it appears that regular employment in an area related to CS provided additional advantages related to enhanced confidence in career readiness (Hernandez-Gantes et al., 2018).

Based on the total analysis, it is important to note two crucial mediating factors for interest development and career readiness that were absent from the participants' accounts, both related to environmental supports in secondary education. While all participants recognized the role of supportive teachers, none acknowledged any impact from interactions with guidance counselors in schools regarding their development of career interests. This limited support is often noted in the literature on career readiness pointing out the many duties of counselors in schools and their heavy load of students, which prevents them from providing individualized attention (American School Counselor Association, 2018; Huss & Banks, 2001). In addition, no one realized the availability of career and technical education programs in school, such as career academies, which provide specific preparation in STEM-related fields and typically offer opportunities for meaningful work-based learning opportunities (Hernandez-Gantes, 2016). For instance, career academies in computer and information technology are often recognized for their role in boosting participation and enhanc-

ing career readiness in CS-related pathways (Hernandez-Gantes et al., 2018). In this regard, it has been documented that students with a strong background in mathematics are often tracked into college-preparatory courses and lose the opportunity to benefit from participation in such programs, and this may have been the case for the participants in this study (Hernandez-Gantes, 2016; Hodge et al., 2020).

In all, using literature on boosting and broadening participation in CS and SCCT premises as a frame of reference, we largely confirmed the role of family influences, the impact of environmental support in the secondary education pipeline, and the contribution of intrinsic motivation and self-determination for pursuing undergraduate studies in CS. Observed differences also aligned with related literature, while in other cases, related findings may have been a function of the small group of participants in the study. To this end, it is important to acknowledge the exploratory nature of the study and the small number of participants, which precludes generalization of findings. While the findings are reasonable, they represent the perspectives of a small pool of students with limited representation of gender and race/ethnicity. Thus, further research is warranted with a more robust inclusion of participants from underrepresented backgrounds in CS.

REFERENCES

- Aderoju, D. (2016). *Tech experts sound the alarm on computer science classes*.
<http://edscoop.com/center-for-american-progress-urges-k-12-schools-to-teach-computer-science>
- Alba, D. (2016). *Hub? Schools think kids don't want to learn computer science*.
<http://wired.com/2015/08/schools-don't-think-kids-want-learn-computer-science/>

- Alexander, P., Holmner, M., Lotriet, H., Matthee, C., Pieterse, V., Naidoo, S., Twinomurini, H. & Jordaan, D. (2011). Factors affecting career choice: Comparison between students from computer and other disciplines. *Journal of Science Education Technology*, 20(3), 300-315. <https://doi.org/10.1007/s10956-010-9254-3>.
- Almarode, T., Subotnik, F., Crowe, E., Tai, H., Lee, M., & Nowlin, F. (2014). Specialized high schools and talent search programs: Incubators for adolescents with high ability in STEM disciplines. *Journal of Advanced Academics*, 25(3), 307-331. <https://doi.org/10.1177/1932202X14536566>
- American School Counselor Association (2018). *The school counselor and career and technical education*. <https://schoolcounselor.org/Standards-Positions/Position-Statements/ASCA-Position-Statements/The-School-Counselor-and-Career-and-Technical-Educ#:~:text=When%20school%20counselors%20provide%20all,entering%20the%20world%20of%20work>.
- Ashford, S. N., (2016). *Our counter-life herstories: The experiences of African American women faculty in U.S. computing education* (Doctoral dissertation, University of South Florida). <http://scholarcommons.usf.edu/etd/6171>
- Baker, S., & Edwards, R. (2012). *How many qualitative interviews is enough* [Unpublished discussion manuscript]. National Centre for Research Methods, University of Southampton, UK.
- Bandura, A. (1997). Self-efficacy: *The exercise of control*. W. H. Freeman W H Freeman/Times Books/Henry Holt & Co.
- Boston, J. & Cimpian, A. (2018). How do we encourage gifted girls to pursue and succeed in science and engineering? *Gifted Child Today*, 41(4), 196-207.
- Brown, B. (2015). Computer science enrollments rocketed last year, up 22%; Demand for technical workers lures B.S. candidates in Comp-Sci. *Network World*. <http://go.galegroup.com.ezproxy.lib.usf.edu/ps/i.do?id=GALE%7CA361809618&v=2.1&u=tamp44898&it=r&p=A-ONE&sw=w&asid=7e4027d64821c2e902384d5a0f7c7281>
- Chang, E. (2018a). *Brotopia*. Penguin Publishing Group.
- Chang, E. (2018b). "Oh my god, this is so f---ed up": Inside silicon valley's secretive, orgiastic dark side. *Vanity Fair*. <https://www.vanityfair.com/news/2018/01/brotopia-silicon-valley-secretive-orgiastic-inner-sanctum>
- Cobo, M. (2019). The most valuable college majors are where the jobs are. *Forbes*. <https://www.forbes.com/sites/mariaclaracobo/2019/07/31/the-most-valuable-college-majors-are-where-the-jobs-are/#487508ea78a0>
- Code.org (2020). *Why computer science?* <https://code.org/promote>
- Computer Research Association. (2015). *All STEM jobs graph*. <http://cra.org/govaffairs/wpcontent/uploads/sites/6/2014/10/All-STEM-Jobs-Graph-Feb-2014.pdf>
- Corbin, K. (2016). Ethnic, gender imbalances plague computer science education. *CIO*. <http://www.cio.com/article/3086084/education/ethnic-gender-imbalances-plague-computer-science-education.html>

- Davis, S. (2017). Read the Google diversity memo that everyone is freaking out about. *The Federalist*. <http://thefederalist.com/2017/08/08/read-the-google-diversity-memo-that-that-everyone-is-freaking-out-about/>
- Deemer, E.D., Thoman, D.B., Chase, J.P., & Smith, J.L. (2014). Feeling the threat: Stereotype threat as a contextual barrier to women's science career choice intentions. *Journal of Career Development*, 41(2), 141-158. <https://doi.org/10.1177/0894845313483003>
- Elman, C., Gerring, J., & Mahoney, J. (2016). Case study research: Putting the quant into the qual. *Sociological Methods & Research*, 45(3), 375-391.
- Fayer, S., Lacey, A., & Watson, A. (2017). *STEM occupations: past, present, and future*. U.S. Department of Labor Statistics.
- Fouad, N. A., & Santana, M. C. (2017). SCCT and underrepresented populations in STEM fields: Moving the needle. *Journal of Career Assessment*, 25(1), 24-39. <https://doi.org/10.1177/10690727166658324>
- Frieze, C., & Quesenberry, J. L. (2020). *Cracking the digital ceiling: Women in computing around the world*. Cambridge University Press. doi:10.1017/9781108609081
- Garriott, P.O., Hultgren, K.M., & Frazier, J. (2017). STEM stereotypes and high school students' Math/Science career goals. *Journal of Career Assessment*, 25(4), 585-600. <https://doi.org/10.1177/1069072716665825>
- Gnilka, P.B., & Novakovic, A. (2017). Gender differences in STEM students' perfectionism, career search self-efficacy, and perception of career barriers. *Journal of Counseling & Development*, 95(1), 56-66. <https://doi.org/10.1002/jcad.12117>
- Google & Gallup. (2016). *Trends in the state of computer science in U.S. k-12 schools*. <http://goo.gl/j291Eo>
- Grbich, C. (2013). *Qualitative data analysis an introduction*. Sage.
- Gustafsson, J. (2017). Single case studies vs multiple case studies: a comparative study. *Divia-portal.org*. <http://www.divia-portal.org/smash/get/diva2:1064378/FULLTEXT01.pdf>
- Hill, C., Corbett, C., & St. Rose, A. (2010). *Why so few? Women in science, technology, engineering, and mathematics*. American Association of University Women.
- Hernandez-Gantes, V.M. (2016). College and career readiness for all: The role of career and technical education in the US. In D. Wyse, L. Hayward, and J. Pandya (Eds.), *SAGE Handbook of Curriculum, Pedagogy and Assessment* (pp. 674-689). Sage.
- Hernandez-Gantes, V.M., Keighobadi, S., & Fletcher E.C. (2018). Building community bonds, bridges, and linkages to promote the career readiness of high school students in the United States. *Journal of Education and Work* 31(2), 190-203. <https://doi.org/10.1080/13639080.2018.1434871>
- Hodge, E., Dougherty, S., & Burris, C. (2020). *Tracking and the future of career and technical education: How efforts to connect school and work can avoid*

- the past mistakes of vocational education*. National Education Policy Center. <http://nepc.colorado.edu/publication/cte>.
- Huss, S.N., & Banks, A.L. (2001). Career and technical education: Getting school counselors on board. *In Brief: Fast Facts for Policy and Practice, No. 15*. National Dissemination Center for Career and Technical Education.
- Janesick, V. (2016). *Contemplative qualitative inquiry*. Routledge.
- Kara, H. (2017). *Research and evaluation for busy students and practitioners*. University of Chicago Press.
- Lent, R., Brown, S., & Hackett G. (2000). Contextual supports and barriers to career choice: A social cognitive analysis. *Journal of Counseling Psychology*, 47(1), 36-49.
- Martinez, A., & Gayfield, A. (2019). *The intersectionality of sex, race, and Hispanic origin in the STEM workforce*. U.S. Census Bureau. <https://www.census.gov/content/dam/Census/library/working-papers/2019/demo/sehsd-wp2018-27.pdf>
- National Center for Education Statistics. (2019). *Table 325.35. Degrees in computer and information sciences conferred by postsecondary institutions, by level of degree and sex of student: 1970-71 through 2017-18*. https://nces.ed.gov/ipeds/data/digest/d19/tables/dt19_325.35.asp?current=yes
- National Science Foundation (2018). *Science & engineering indicators 2018*. <https://nsf.gov/statistics/2018/nsb20181/report>
- Niemiec, C., & Ryan, R. (2009). Autonomy, competency, and relatedness in the classroom. *Theory and Research in Education*. 7(2), 133-144. DOI: 10.1177/1477878509104318
- Pollack, E. (2015). What really keeps women out of tech? *The New York Times*. <http://nytimes.com/2015/10/11/opinion/Sunday/what-really-keeps-women-out-of-tech.html?smid=fb-nytimes&smtyp=cur&r=2>
- Ratcliffe, R. (2015). Nobel scientist Tim Hunt: female scientists cause trouble for men in labs. *The Guardian*. <http://www.theguardian.com/uk-news/2015/jun/10/nobel-scientist-tim-hunt-female-scientists-cause-trouble-for-men-in-labs>
- Ryan, R.M., & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78. <https://doi.org/10.1037/0003-066X.55.1.68>
- Ryan, R.M., & Deci, E.L. (2002). *Overview of self-determination theory: An organismic-dialectical perspective*. In E.L. Deci & R.M. Ryan (Eds.), *Handbook of self-determination research* (p. 3-33). University of Rochester Press.
- Savoca, M., Kernan, K., Scott, C., & Bugallo, M. (2023). Early exposure to STEM research as a foundational experience for STEM careers. *Experiential Learning and Teaching in Higher Education*, 6(1), 46-55. <https://doi.org/10.46787/elthe.v6i1.3567>
- Scarpelli, B., Miller, N., & Stephens, R. (2017). *State of the App economy*. The App Association. https://actonline.org/wp-content/uploads/App_Economy_Report_2017_Digital.pdf

- Schmidt, J.A., & Shumow, L. (2012). Change in self-efficacy in high school science classrooms: An analysis by gender. In Britner, S. (Ed.), *Self-Efficacy in School and Community Settings* (53-73) Nova Science Publishers, Inc.
- Spellings, M. (2006). *A test of leadership charting the future of U.S. higher education*. U.S. Department of Education.
- Stake, R. (1995). *The art of case study research*. Sage Publications.
- Sullivan, A., & Bers, M. (2017). *Literature review: The gender gap in STEM fields*. Unpublished.
- Tademy, R., & Clark, T. (2008). Trumping truancy: A transactional application of the triadic reciprocity theory. *Theory in Action*, 1(1), 71-92.
- Tinto, V. (2017). Reflections on student persistence. *Student Success*, 8(2), 1-8. <https://doi.org/10.5204/ssj.v8i2.376>
- United States Bureau of Labor Statistics. (2020). *Table 1.11 Employment in STEM Occupations, 2018 and projected 2028*. <https://www.bls.gov/emp/tables/stem-employment.htm>
- Wang, M., & Degol, J. (2013). Motivational pathways to STEM career choices: Using expectancy-value perspective to understand individual and gender differences in STEM fields. *Developmental Review*, 33(4), 304-340. <https://doi.org/10.1016/j.dr.2013.08.001>.
- Wang, X. (2013a). Modeling entrance into STEM fields of study among students beginning at community colleges and four-year institutions. *Research in Higher Education*, 54(6), 664-692. <https://doi.org/10.1007/s11162-013-9291-x>
- Wang, X. (2013b). Why students choose STEM majors: Motivation, high school learning, and postsecondary context of support. *American Educational Research Journal*, 50(5), 1081.
- Zehner, J. (2016). *One million unfilled jobs in tech! Say what?* LinkedIn. <http://www.jackizehner.com/2016/01/15/one-million-unfilled-jobs-in-tech-say-what>

Vocational Education and Training and its Role in Reducing the Risk of High School Dropout in the United States: A Survival Analysis

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ABSTRACT

Vocational Education and Training (or Career and Technical Education, CTE, as is known in the United States) is a viable educational option to increase student engagement, and recent research shows that CTE helps reduce the risk of dropping out among high school students. In the context of changes in the

high school curriculum and CTE at the beginning of the 21st century, advocates for secondary career and technical education have argued that CTE provides many benefits to high school participants. The current study was designed to test one claim, that CTE can reduce the likelihood of students leaving high school prematurely. We analyzed how enrolling in different levels of CTE credit-taking affected students' risk of dropping out of high school when focusing on specific occupational areas. Our approach departed from the traditional classification where students were considered either vocational or academic. Two types of CTE participation were tested: cumulative credits in CTE and fulfilling the requirements in a CTE occupational program by taking three or more credits. Hazard ratios from our survival analysis showed a decreased risk of dropping high school for students taking three or more CTE credits, regardless of whether those credits were taken in an occupational area or not. We also found that while, overall, gender was not a predictor of dropping out, male students who took three or more credits in an occupational area had a reduced risk of dropping out. Also, a higher 9th-grade GPA reduced the risk of dropping out, but older students would see an increase in their risk of dropping out. This study was conducted using restricted data from the Education Longitudinal Study.

INTRODUCTION

The impact of Vocational Education and Training (hereafter career and technical education, CTE, as it is known in the United States) on high school students has been scrutinized in several areas, but more so and with greater emphasis on academic preparation and achievement (Levesque et al., 2008;

McCormick & Tuma, 1995; Michaels & Barone, 2020; Silverberg et al., 2004). An often-asked question has been: Does CTE help prevent students from dropping out? This question has become more critical as CTE has expanded its program and course offerings within the framework of the 16 career clusters (Advance CTE, n. d.).

The current national dropout rate is estimated at 5.1%, which includes about 2 million dropouts as of 2021 (National Center for Education Statistics [NCES], 2022a). While this is an important improvement compared to a decade ago, dropout rates are much higher among Hispanic, Black, Native American/Alaskan Native populations and students of lower socioeconomic status (NCES, 2022b). Although it is still too soon to have a definitive assessment, research conducted so far on the impact of COVID-19 indicates that the pandemic may not have had a significant effect on the dropout rates in the US—contrary to what happened in schools around the world (Moscoviz & Evans, 2022). For example, a study by Harris and Chen (2022) reports that the graduation rate slightly increased in 2020 and came back to levels of prior years in 2021. For other achievement measures, recent reports show statistically significant and profound declines, in 2023 compared to 2012 in score assessments in mathematics (271 v. 285), reading (256 v. 263), and other subjects (National Assessment of Educational Progress, 2023).

Even before the COVID-19 pandemic, there had been a renewed interest in CTE as a viable educational option to help students stay in high school (Stone, 2009; 2014). Most recent studies reported on the positive effect on dropout reduction of CTE coursework in comprehensive schools (e.g., Blowe & Price, 2012; Campbell & Laughlin, 1988; Kulik, 1998; Plank,

2001), but others have expanded the analyses to other settings or populations. For example, some research has looked at the connection between specific models of CTE delivery (e.g., comprehensive high schools, area technical centers, technical high schools, career academies) and dropout reduction, mainly through enrollment in secondary technical schools (Brunner et al., 2021; Neild et al., 2015), CTE-dedicated high schools (Kemple et al., 2023), or career academies (Hemelt et al., 2019). Other studies have reported on the positive effect of CTE on the graduation of students with learning disabilities (Dougherty et al., 2018; Theobald et al., 2019), or on students from racial minorities (Castellano et al., 2007; Conchas & Clark, 2002).

With changes being implemented in the high school and CTE curricula, it is worth exploring whether CTE has continued to have an impact on preventing student dropout.

RESEARCH PROBLEM, PURPOSE, AND RESEARCH QUESTION

The last part of the 1990s and new millennium brought important changes to the education system and CTE. One of the most important changes was the requirement of core academic credits for all high school students to graduate, including CTE students. CTE then became an elective path, and if credits were taken in a sequence, it would place students in a program of study and career pathway for an occupation and postsecondary education (the “new model”). As a result, the formal academic and research distinction and classification of vocational (CTE) and academic students ceased (Aliaga et al., 2012). Therefore, at the beginning of the 21st century, CTE did not look like the “old

model.” However, little is known about the impact of CTE on reducing student dropout at that point in time, no analysis has been conducted on that relationship, and no new knowledge has been developed about the impact of those changes. We identify this as our research problem.

The purpose of this study was to explore the impact of taking different levels of CTE credits on reducing the risk of student dropout in high school at a time when major changes were being introduced in the educational system and CTE.

Our study was designed to address the following research question:

Do different levels of CTE credit-taking help reduce the risk of dropping out among high school students?

PERSPECTIVES ON STUDENTS' DROPOUT AND CTE

THE HIGH SCHOOL DROPOUT PROBLEM

Dropouts are those in the 16- to 24-year age range who are unregistered in high school and lack a high school credential (NCES, 2022c). Even though the student dropout rate has decreased significantly in recent years, it still accounts for about 2 million students (NCES, 2022a). However, racial minorities are still more likely to drop out as the status dropout rate for 16- to 24-year-olds in 2020 indicates that the dropout rate is 2.4% for Asian students, 4.2% for Black/African American, 4.8% for White, 7.4% for Hispanic, 11.5% for American Indian/Alaska Native, and 6.5% for those students with two or more races (NCES, 2022b). Males drop out more than females at 6.2% vs. 4.4%, and those in the lowest quarter of the socioeconomic status drop out at 7.2%.

Years of research have shown that the dropout phenomenon cannot be attributed to a single factor. Instead, dropping out is the culmination of a process that involves more than school factors (Rumberger & Rotermund, 2012), including socioeconomic status, gender, family issues, and many more (Doll et al., 2013).

When students drop out of high school, they begin their adult lives with many issues that will limit their life choices, and they are expected to face many problems throughout their lives. Often raised is the economic and financial impact of dropouts. Rumberger (2011) reported that the financial and social repercussions have increased as the requirements for a higher-educated workforce have amplified. Young dropouts are more likely to be jobless, welfare receivers, and, if employed, to make less money than those who did obtain a high school diploma (Swanson, 2009). In 2021, the median annual earnings of high school dropouts was 53% of the total labor force, while the percentage was 67.9 for high school graduates (NCES, 2022d), which translates into \$200,000 less in a lifetime (Day & Newburger, 2002). The correlation between dropping out of high school and the lack of skills complicates dropouts' entry into and staying in the labor market, locating a job, and earning an adequate salary, and "in any given year, the likelihood of slipping into poverty is about three times higher for high school dropouts than for those who finished high school" (Annie E. Casey Foundation, 1998, as quoted in Schargel & Smink, 2001, p. 4). Belfield et al. (2012) calculated the economic cost of dropouts in the broader social context, arguing that "both taxpayers and society lose out when the potential of these youth is not realized" (p. 1). According to their estimates, the "average opportunity youth imposes a total fiscal burden of \$13,890 and a total social burden of \$37,440" (p.

15) per year for those aged 16-24. Throughout their lifetime, the social burden is calculated at \$704,020, totaling \$4,745.1 billion for their cohort (p. 25).

Dropping out of school also “tends to coincide with increased delinquency, teen pregnancy among females and incidents of alcohol drug use and abuse” (Uretsky, 2019, p. 1), as well as poor health and homelessness. Dropouts are more likely to join gangs, participate in other criminal acts, and serve jail time (Battin-Pearson et al., 2000; McFarland et al., 2016; Rumberger, 2011; Swanson, 2009).

CTE AND HIGH SCHOOL DROPOUTS

THE EXPECTATION IN THE BROADER CONTEXT:

VIEWS OF THE SOCIETAL ROLE OF CTE

CTE has an important place in the education debate about reducing student dropout. The fact that 88.0% of all students take at least one CTE credit (NCES, n. d.; Table H186) in secondary education has not only increased the interest in CTE but also deepened the scrutiny of its impact on reducing student dropout. Central to that debate is the belief that CTE increases engagement among high school students (Xing & Gordon, 2021).

CTE provides an authentic learning context that fosters students’ engagement in school, including affective engagement (Diehl, 2020), where students have a space to apply their knowledge and skills through hands-on learning, collaboration, and practical work experience through work-based learning. The National Assessment of Vocational Education Independent Advisory Panel in 2004 strongly advocated for the unique opportunity CTE provides for learning, indicating that:

a career focus often gives students a sense of direction and motivates them to achieve and to stay in school. Practically inclined students can become hooked on academic learning through CTE study. This is especially important for young people who learn best by doing, a group that includes disproportionate numbers of disadvantaged and special education students. Just having the option of being able to concentrate in CTE in high school results in more young people staying in school because more individually relevant choices are available to them (p. 6).

The view of CTE is that it supports students' engagement and learning by "providing young people with the academic, technical, and employability skills and knowledge to pursue post-secondary training or higher education and enter a career field prepared for ongoing learning" (American Institutes for Research, 2013, p.1). CTE has benefitted students considered underachieving and those unable, unwilling, or unexpected to graduate for different reasons (Castellano et al., 2003, p. 243). Under this premise, students would enroll in CTE to make their high school experience beneficial—in educational, social, and economic terms. Even today, CTE is viewed as an avenue to the middle class for impoverished students (Aliaga, 2022).

RESEARCH ON CTE AND STUDENT DROPOUT UNDER THE "OLD MODEL" OF CTE

Research on the link between CTE and student dropout reduction is not new. Research conducted in the 1980s and 1990s under the "old model" of CTE was inconclusive about the

effects of CTE on dropouts. One noticeable aspect of the disparity of the reported results is that, at least in part, they may be the artifact of the variability of approaches used, as discussed by Aliaga (2023).

Using regression models with data from the NLS Youth Cohort for 1979 and 1980, Mertens et al. (1982) concluded that vocational education coefficients were “always associated positively with school completion” (p. 90). Similarly, Catterall and Stern (1986), using 1980-1982 California data from the High School & Beyond longitudinal dataset, argued that vocational (CTE) education had a dropout-preventing effect on students. A more neutral conclusion was described by Agodini and Deke (2004), who, using NELS data for the 1980s and 1990s, found that students engaged in CTE had the same chance of dropping out as the average high school student. In their final report to Congress, Silverberg et al. (2004) stated that the research they evaluated slightly positive effects of CTE on students completing high school.

A different approach was taken by Plank et al. (2008). Using data from the National Longitudinal Survey of Youth of 1997, they applied survival analysis models to study students’ dropout, for which their academic/vocational credit-taking ratio was examined. They concluded that “some CTE, combined with core academic course taking, may decrease the risk of dropout—but only up to a point” and that “one CTE course for every two core academic courses is associated with the lowest risk of dropping out” (p. 360). Bozick and Dalton (2013) did not see any direct connection between CTE and dropout prevention, indicating that occupational courses “were unrelated to the likelihood of dropping out” (p. 47) but, at the same time, stressed

that “occupational courses may serve as a mechanism to keep those in school who are struggling academically” (p. 50).

Evaluating the impact of CTE, Bishop and Mane (2004) pointed out that enrolling in more CTE would result in an increased high school graduation rate by 2.6%. In a literature review that included several types of research, Cohen and Besharov (2004) summarized that “more credible studies using large databases suggest that CTE has a modest positive effect on high school completion,” and more specifically, “taking a vocational course or being on the vocational track as compared with the general track seems to increase students’ chances of completing high school” (p. 48).

RESEARCH UNDER THE “NEW MODEL” OF CTE

Research studies conducted after the implementation of the comprehensive school reform (i.e., under the “new model” of CTE) show more consistent findings about the positive effect of CTE in reducing student dropout. The variety of studies using nationwide, regional, or state data helps us understand CTE and its connection to student dropout in a broader context since it captures the phenomenon at different levels.

Rumberger and Arellano (2007) studied the experiences of students in 63 high schools in California that were part of the Education Longitudinal Survey of 2002. They observed that students enrolling in the vocational track were twice as likely to graduate high school. Analysis of data from the Commonwealth of Virginia for the academic years 2008 through 2010 indicated that CTE completers “attained mean high school cohort graduation rates of 6% to 13% higher than non-CTE completers for the years of the study” (Blowe & Price, 2012, p. 7)

Recent studies about the impact of CTE on reducing dropout rates have focused on the different types of CTE delivery models, bringing in a broader discussion about CTE and dropouts. In a study conducted in three schools in a school district in the western United States, Castellano et al. (2017) found that “holding student characteristics constant, enrolling in a POS [program of study] high school increased students’ probability of graduation by an average of 11.31 %” (p. 61). They also reported that for each CTE course a student took, their likelihood of graduation increased by 4%.

In a study of students attending the school district of Philadelphia in 2003, 2004, and 2005, Neild et al. (2015) found that students attending CTE had between 20% and 36% higher odds of graduating high school. Using data from Massachusetts, Dougherty (2018) concluded that “CTE participation in an RVTS [regional vocational and technical high schools] is associated with higher probabilities of graduating from high school on time” (p. 129). Hemelt et al. (2019) examined participation in a technology career academy, and their results showed it increased the likelihood that a student graduates from high school by about eight percentage points. Focused on technical high schools, a different model, Brunner et al. (2021) used a regression discontinuity approach to analyze data for students in the academic years 2005-06 to 2012-13. They concluded that enrolling in that type of school increased high school graduation rates by six percentage points overall. Kemple et al. (2023) examined the impact of 37 CTE-dedicated high schools in New York City and found that by the end of 12th grade, CTE and non-CTE students graduated at the same rate.

Other studies have been conducted at the national level, usually looking at the impact of CTE coursework. Gottfried and

Plasman (2018) analyzed the timing of dropping out of school and how that related to CTE credit-taking. They observed that “taking a greater number of CTE units across Grades 9 through 12 was associated with a lower chance of dropping out” (p. 343). Similarly, Gottfried (2022) concluded that “there was a positive association between early high school AS [Applied STEM] course taking and high school completion” and that “the odds were approximately 2.22-to-1 [of graduating] for those who took an AS course” (p. 187). Xing and Gordon (2021) estimated that “for all students, participation in CTE coursework had a significant and positive influence on high-school on-time completion over non-completion. Specifically, the change from a CTE non-participant to a participant (or from a participant to a concentrator) resulted in 1.68 times the odds of the student completing high school on time over the odds of non-completion” (p. 15).

CONCEPTUAL FRAMEWORK

POLICY CHANGES IMPACTING THE HIGH SCHOOL CURRICULUM AND CTE

By the early 2000s, high school students attended schools with a curriculum that emphasized academic content and included a set of standards and core requirements for all students, including those enrolling in CTE.

CTE, too, was different because of “the inclusion of rigorous academic coursework in CTE programs and instruction” (Cushing et al., 2019, p. 4), the consistent offering of work-based learning, and the articulation agreements with postsecondary institutions (Castellano et al., 2003; Young et al., 2011). Thus, students enrolling in CTE at the turn of the new century started to be exposed to more academic content, a different set of expanded

CTE programs, curriculum, and instructional designs that were unlike the ones that existed under the “old model” (vocational education). Two underlying new educational concepts for CTE students in the late 1990s and early 2000s were programs of study, the completion of which became an accountability indicator (see Imperatore & Hyslop, 2017), and career pathways, which was instituted as a matter of policy later on with the adoption of the Strengthening Career and Technical Education for the 21st Century Act (2018), also known as Perkins V.

Changes in the high school curriculum and CTE had as a goal the increase of students’ academic achievement and the development of knowledge and skills that would prepare them for a career. The ultimate purpose was to help students complete high school, graduate, and be prepared “concomitantly for employment *and* higher education” (Lynch, 2000, p. 158). Consequently, the improved curricula and instructional designs would help reduce student dropout by providing engaging learning activities, hands-on experience, and educational pathways to help them stay in school. At that historical moment, these CTE policies and school changes provide an important context to evaluate the impact of CTE on student dropout.

CONSTRUCTIVISM AND CTE: ENGAGING IN LEARNING TO REDUCE STUDENT DROPOUT

Although research has not concluded on specific factors that lead to student dropout, several studies have pointed out the role played by engagement (Archambault et al., 2009; Janosz et al., 2008; Manzuoli et al., 2019; Piscitello et al., 2022; Robison et al., 2017; Rumberger & Rotermund, 2012), proposing that both social and academic engagement, as well as other individ-

ual and institutional factors, can lead to school completion, thus preventing or reducing dropping out of schools (Rumberger & Rotermund, 2012).

Constructivism provides a more comprehensive approach to understanding student learning and engagement in school in connection to CTE. The relationship between constructivism and CTE can be traced back to the 19th century when there was much discussion about the philosophy informing the model for vocational education. Social efficiency and constructivism, in particular, were debated in connection to the passing of the Smith-Hughes Act of 1917, with the former becoming the prevailing philosophical influence (DeFalco, 2016). The current policy in Perkins V and its emphasis on programs of study, career pathways, and work-based learning, to some extent brings back a framework that focuses on learning and preparing students for further education, for a career and employability—beyond the preparation only for an occupation (Patton, 2005), thus taking on the premises of constructivism.

A central tenet of social constructivism is the learner's role in knowledge creation and the significance of experience in that process (Applefield et al., 2000; Fosnot, 1996; Steffe & Gale, 1995). Experience is seen as a knowledge catalyst, whether it is socially-oriented or object-oriented (Doolittle & Camp, 1999). The more the experience is enhanced, the more the knowledge will be improved. Real-life experiences are essential, and this way, individuals can construct an accurate portrayal of the real world (Burhanuddin et al., 2021). Constructivism also emphasizes the importance of content and skills aligning to the individual's current situation, knowledge, goals, and cultural background (Richardson, 2003). This elevates one's motivation to

continue experiences that will strengthen their skills (Pintrich & Schunk, 1996).

Equally crucial for CTE and student learning, from a social constructivism approach, are two concepts: the first one is situated learning, which indicates that “knowledge is conceived as being embedded in and connected to the situation where the learning occurs” (Applefield et al. 2000, p. 38). Because of the nature of the CTE programs and fields, the learning always occurs in the context of, for example, agriculture, engineering, health, and other areas.

The second concept is working on collaboration, in contact with other learners, including the instructor. This is particularly clear in the case of work-based learning, “where one learns on the job by closely working” with others (Applefield et al., 2000, p. 39), and reinforces the idea of “the social nature of knowledge and the belief that knowledge is the result of social interaction and language usage and, thus, is a shared, rather than an individual, experience” (Marques, 2017, p. 183).

The CTE curriculum is ideal for tapping on these constructivist pedagogical elements, thus ensuring that shared meaning and knowledge are created within a group process (Richardson, 2003). Adopting a constructivist pedagogy in CTE enhances the likelihood of students engaging in school and thus reducing the chances of dropping out.

METHOD

This is a causal-comparative research study that used a longitudinal cohort survey. Causal-comparative designed studies look into the relationships between variables and the possible causes “for a behavior pattern by comparing subjects in whom this pat-

tern is present with similar subjects in whom it is absent or present to a lesser degree” (Borg & Gall, 1983, p. 533). A central feature of causal-comparative research is that it “focuses on making group comparisons” (Mertens, 1998, p. 86), which is the primary objective of this study.

The first part of our analysis provides descriptive statistics of the relationships between background characteristics and variables of interest. We used Chi-square to test independence between those variables and whether the relationship between them varied by the categories used. In the second part of our analysis, we used a survival model.

DATA AND SAMPLE

We used data from the Education Longitudinal Study of 2002 [ELS:2002]. The ELS:2002 “follows a nationally representative cohort of students from the time they were high school sophomores through the rest of their high school careers” (NCES, 2010, Overview section, ¶ 3).

By the time data for ELS:2002 started to be collected, students had begun to be exposed to a new high school curriculum and CTE programs, and the new school reality provided an ideal policy and programmatic context to analyze the CTE credit-taking patterns and whether and how they impacted student dropout. Although there is a preference that the newness of data is superior to older counterparts, we concur that “dichotomizing research into ‘old’ and ‘new’ creates an arbitrary duality that promotes dismissal of valuable knowledge from earlier time periods and an artificial limitation of accepted knowledge based on the value of newness” (Hong et al., 2022). Even though the

ELS:2002 data are older, they still have value that can enlighten our views of CTE in the classroom, particularly at the beginning of the 21st century.

We used two sets of the ELS:2002 data. The first is the *public* file, which is data publicly available to any user, that we used to explore the relationships between background characteristics and variables of interest displayed in Tables 2 through 4. The second includes data from the *restricted-data* file, available only through restricted licenses granted by NCES. We used the restricted ELS:2002 datasets for the primary analysis of this study (Tables 5 and 6, and Figure 1). The reporting sample in the survival model is restricted to graduates of U.S. public high schools, grades 10 to 12, with an overall reporting sample of $N=9,243$.

VARIABLES

EXPLANATORY VARIABLES

We conducted our study using a set of exploratory variables, including CTE credit-taking, and three types of variables that are more commonly used in CTE research (see, among others, Alexander et al., 1997; Bowers et al., 2013; Christle et al., 2007; Dougherty, 2018; Gottfried & Plasman, 2018; Plank, 2001; Pong & Ju, 2000; Xing et al., 2020): (a) students' demographic and background characteristics, that includes gender, race, socioeconomic status, and age; (b) students' prior achievement, specifically math tests scores at 10th grade, 9th-grade and overall high school GPA, and expectations of the high level of educational achievement; and (c) students' high school type.

We used a variable that represents three different groups of CTE credit-taking students: a) Those who took three or more

credits focusing on an occupational area (or specific labor market preparation area), b) those who took three CTE credits but did not focus on an occupational area, and c) those who took less than three CTE credits (Table 1). The latter group became our comparison group. Students in the comparison group choose to take a more limited exposure to CTE possibly because such enrollment complemented a more academically-oriented curriculum, lacked an interest in a specific occupational area, or because their school may not have offered other courses in the same occupational area.

DEPENDENT VARIABLE

We used a “dropout status” variable in our descriptive analysis that describes students’ dropout status as of 2004—the Spring semester of the student’s senior year in the survey cohort. The dependent variable in our hazard model is the event when students drop out of high school.

ANALYTICAL FRAMEWORK

Our survival analysis models the time for some event to occur—in this case, dropping out of high school, which is an event that represents a transition from one state to another (Hougaard, 2000). Consequently, survival analysis allows us to “observe something that develops dynamically over time” (p. 36), as it “focuses on the distribution of survival times” (Fox, 2002, p. 1).

We used a condensed version of the CTE typology reported by Aliaga et al. (2014). The typology informs participation in CTE for *all* high school students and whether those cred-

its were taken in the same specific labor market preparation (SLMP) area. The typology is a practical framework because it is based on the actual number of credits students took. Furthermore, the typology brings a different paradigm for analysis that avoids analysis based on the divide between academic and CTE students. Their typology originally used eight categories, but the authors indicated that those categories could be grouped according to the research needs. Thus, we included three groups (see Table 1). We focused our analysis on those students taking three or more CTE credits because it reveals an intent to focus on an occupational area or make a combination that may be useful for their future endeavors (Stone & Aliaga, 2007).

RESULTS

DESCRIPTIVE DATA

Chi-square tests were used to identify the relationships between gender, race, socioeconomic status, prior student achievement, expectation of the highest educational achievement, and school location with GPA and dropout status.

First, we examined the association between background variables and the categorical cumulative GPA for grades 9 through 12 (Table 2). We started with GPA because it has been associated with students' engagement and staying in school (Bridgeland et al., 2006; Rumberger & Rotermund, 2012). Our analysis showed that more male students reported having lower levels of GPA, while more female students had a GPA between 2.51-3.00 and higher. White students, the largest group of students in the sample, had higher GPAs throughout high school than any other students, but they were also the largest group with GPAs

of 3.00 or lower. In both cases, they were followed by Hispanic and African-American students. Students from the lowest socioeconomic status quartile have a lower GPA than all other quartiles, with 19.2% having a GPA of 3.00 and lower, while students with a GPA of 3.0 or lower in the highest quartile amounted to 10.7%—almost half as many. Noteworthy is that few students in the lowest quartile of the SES had a GPA above 3.00 compared to those in the highest quartile. Students in the highest quartile with a GPA of 3.0 or higher were almost three times the number of students with the same GPA in the lowest quartile.

Math test results confirmed other studies about tests predicting academic achievement (Christle et al., 2007; Jimerson et al., 2000). The math test standardized score used in this study was collected in the Spring of 2002 among 10th-grade students and was divided into quartiles. First, 20.9% of all students classified in the lowest math quartile had a GPA of 3.00 or lower, and only 2.2% of students in the same quartile earned a GPA higher than 3.00. The number of students earning a GPA of 3.00 or lower decreased with higher quartiles of math achievement. Students in the highest math quartile with a GPA of 3.00 or lower were almost three times smaller than their counterparts in the lowest quartile (7.5% compared to 20.9%). Conversely, the percentage of students in the highest quartile with a GPA higher than 3.00 was 18.3%, compared to only 2.2% of students in the lowest quartile with the same overall GPA.

Data on the expectation of the highest level of education achievement show that students who didn't know what the highest level of education achievement they would complete, those who were to complete less than high school, students who thought they would get a GED or another high school creden-

tial, and those students who would complete high school only, combined represented 14.1% of all students who would also have a GPA of 3.00 or lower. On the other hand, students who belonged to those groups and had a GPA of 3.00 or higher were only 1.8% of all students. Students who had a GPA of 3.00 or lower expected to attend and complete 2-year college degrees and 4-year college degrees in higher numbers than those with a GPA higher than 3.00, but more students with a GPA of 3.00 or higher expected to complete a graduate degree at the Master or doctoral levels.

Finally, students in rural schools were the smallest group with a GPA of 3.0 or lower, followed by students in urban and suburban schools—the latter registered the highest percentage of all students with a GPA of 3.0 or lower. By contrast, those in suburban schools had the highest rate of students with a GPA higher than 3.0, followed by students in urban and then rural schools.

We also report the relationships between background characteristics and dropout status (see Table 3). ELS:2002 provides three indicators of dropout status: a) dropout, which indicates a student who had dropped out as of Spring of 2004, the Spring semester of their senior year; b) prior dropout, which is described as a student still enrolled in the “Spring term of 2004 at time of survey day but with dropout status at any of the 3 enrollment status updates” (NCES, 2012, p. 207); and c) alternative completer, which is a student who had earned an early GED, before March 15, 2004 (NCES, 2012). For this study, we focused on the dropout-only data.

Overall, dropout rates are higher in male students than among female students, a fact that previous research has also found (Fortin et al., 2013; Kaufman et al., 1996; National Center for Education Statistics, 2022c; Rumberger, 1983). Also, White

students had the highest dropout rate in this cohort, followed by Hispanic and African Americans. In past research, Black/African American students had higher dropout rates (Behnke et al., 2010; Griffin, 2002; Kaufman et al., 1996; Robison et al., 2017; Rumberger, 1983).

Students in the lowest SES quartile showed a dropout rate of 3.2%, the highest among all students, which is consistent with existing literature (O'Connell & Sheikh, 2009; Robison et al., 2017; Rumberger, 1983; Suh et al., 2007; Wood et al., 2017). It decreases as the SES quartiles go up. Prior achievement in the form of a math test taken in 10th grade revealed that those with the lowest scores had the highest dropout rate, which also decreased in the higher quartiles of the test scores. Results in the category of expectations of highest educational achievement confirmed prior studies about school engagement: students who did not know the highest level of education they would achieve registered the highest dropout rate. What is also revealing is that the second highest dropout rate was among students who would expect to attend and complete a 2-year college degree, followed by those who would expect to attend and complete a 4-year college degree. Students who expected to obtain a GED also had a high graduation rate. Lastly, urban and suburban students have the highest dropout rates.

In Table 4, we report the relationships between cumulative GPA for grades 9th through 12th and dropout status. As expected, dropout rates among students with an overall high school GPA of 3.0 or lower were the highest, totaling 5.8%, which is the dropout rate calculated more recently for all students (NCES, 2022a). Interestingly, there were practically no dropouts among students with the highest GPA of 3.51 to 4.00.

SURVIVAL ANALYSIS MODEL: CTE CREDIT-TAKING AND THE RISK OF DROPPING OUT

We start by pointing out that our model reports a chi-square of 234.916, with a p -value of <0.000 , which indicates a good model fit.

The results from our survival model appear to confirm the positive effect of CTE credit-taking on reducing student drop-out (Table 5). The hazard ratio of students who took 3 or more CTE credits focusing on an occupational area is less than 1, indicating a reduced risk of dropping out of about 36%, compared to those taking less than 3 CTE credits. Similarly, the group of students who took 3 or more CTE credits without focusing on an occupational area had a higher reduced risk of dropping out of school of about 51%, compared to those taking less than 3 CTE credits. Overall, this is a significant finding that confirms recent research on the positive impact of CTE on helping students finish high school. The hazard model is depicted in Figure 1.

Our model also showed that overall, for each point increase in the 9th-grade GPA, the risk of dropping out decreased by 73%. On the other hand, for each additional overage year, the likelihood of dropping out increased by 4.1%. It is important to note that neither gender, race, or SES were statistically significant contributors to predicting dropping out in our model.

Because gender was not statistically significant in the overall model, we replicated the same model separately for each the male and female student groups (Table 6). Both gender models reported chi-squares of 123.947 and 90.743, with a p -value of <0.000 , indicating a good model fit in both cases. In the male students' model and at a 95% confidence level, only those stu-

dents who took three or more CTE credits focusing on an occupational area had a reduced risk of dropping out of high school of about 70%, compared to students who took less than 3 CTE credits. However, there was no significant effect for males taking more than three credits and not focusing on an occupational area. For female students, CTE credit-taking, whether or not focusing on an occupational area, was not a significant factor in reducing their risk of dropping out.

Additionally, 9th-grade GPA and age were strong predictors in both gender-based models, predicting a lower risk of dropping out of about 73% to 76% with a unit increase in 9th-grade GPA for male and female students, respectively, but a higher risk of dropping out of between 4% and 5% with each additional year of age. Race and SES were non-significant factors.

DISCUSSION AND CONCLUSIONS

In the context of the new and improved CTE curriculum and program designs implemented at the turn of the 21st century, this study aimed to examine if different levels of CTE credit-taking had any impact on reducing the risk of dropping out of school. Although dropout rates have decreased in recent years, dropping out still represents a problem to address, particularly for some student populations. Research on CTE and student dropouts conducted in the last two decades has consistently shown that CTE has a positive impact on reducing high school dropouts.

The descriptive data from this study (Tables 2-4) show significant relationships between main background factors and dropout rates. Those associations do not entirely explain, *per se*, the phenomenon of dropping out, but they reveal more intricate

interactions at the family and social levels (see Audas & Willms, 2001). Concerning academic performance, there is a clear association between lower GPAs and lower Math test scores by 10th grade with dropping out.

The primary analysis we conducted in this study, using a survival model, confirms the connection between CTE credit-taking and reducing student dropout risk. We began our report by arguing the importance of changes in CTE policy that resulted in changes in the high school curriculum and CTE in the late 1990s and early 2000s. Our analysis confirms that credit-taking patterns that followed those policy changes, specifically changes in CTE, positively impacted high school completion at the onset of the 21st century.

From a constructivist perspective, we have argued that CTE provides an authentic learning context that favors student engagement and that CTE curriculum and program designs contribute to student high school completion. In this study, we focused on coursework as part of our constructivist perspective because CTE courses bring alternative and more meaningful ways of learning. CTE engages students more effectively through project-based, hands-on experience, as well as through its collaborative learning approach, which are characteristics of most CTE courses. In addition, enrolling in CTE coursework that is part of a sequence of courses in CTE programs of study and career pathways (e.g., manufacturing, health sciences, business, etc.) sets a more articulated and relevant context for students to stay and graduate.

Our overall survival analysis model indicates that any student taking three credits in CTE, whether or not those credits were focused in an occupational area, significantly reduces

the risk of high school dropout. In our gender-based survival analysis models, that effect is particularly relevant to male students who took three or more CTE credits but only when those credits focused on an occupational area. In their specific model, female students who enrolled in 3 or more CTE credits do not register an increase or decrease in their risk of dropping out, whether those credits were in an occupational area or not. However, knowing that male students drop out of high school at higher rates, this finding is positive news. It means that while CTE positively affects male students' likelihood of completing school, simultaneously, it does not translate into CTE harming the trajectories for female students who take the same amount of CTE coursework.

In addition to the effect of the CTE coursework, our general model and our models for male and female students also showed a critical variable that helps reduce the risk of dropping out of high school: 9th-grade GPA. Prior academic achievement, namely performance in 9th-grade, signals potential success or failure in completing high school. This is why it is very important to adopt programs and curricula to strengthen students engagement in school as early as possible, and CTE can undoubtedly play an essential role from that perspective. However, we need to be cautious about participation in CTE as early as 9th-grade because, for a majority of schools and students, CTE is offered mainly in comprehensive high schools and usually in the 11th and 12th grades only (Silverberg et al., 2004, p. 20; U.S. Department of Education, 2014, p. 105).

Similarly, it is important to note the role of age in predicting the risk of dropping out. In our three models, the overage the student, the higher the risk of dropping out of high school. Age may be associated with disengagement and other factors

(family challenges, risky behavior, etc.), and as students grow older, those issues may be accentuated. If CTE can engage these students in school, it faces the challenges referred to above—that since, for a vast majority of students, CTE is offered in the last two years of high school, it may be a little too late for them as a viable option.

It is intriguing, however, that gender, race, and socioeconomic status are not predictors of reducing or increasing the risk of dropping out while controlling for other key characteristics, even though policies have been designed to target students with those characteristics with greater dosage of CTE because of their perceived greater likelihood of dropping out. This would justify further research.

The discussion about the impact of CTE on reducing dropouts in the context of the current curriculum also poses the question of the impact of programs of study and, more broadly, career pathways. Career pathways are “templates for [1] the integration of academic and technical content and [2] the articulation of secondary and postsecondary instruction within specific career clusters” (Lewis, 2008, p. 166) that provide “knowledge and skills, both academic and technical, that must be acquired to prepare for occupations at varying levels within these [career] clusters” (p. 169).

In addition to coursework, further research should include work-based learning participation, earning industry-recognized credentials, participation in CTE student organizations, and the combined effect of these designs on student dropout to have a more rounded perspective.

A critical contribution of this study is that it relies on CTE credit-taking levels to understand students’ risk of dropping

out of high school, and thus avoids the analysis based on CTE concentration categorization and the use of the student dichotomy of CTE vs. academic. These findings are important because they confirm, through a different analytical framework, the positive impact of CTE on student engagement and dropout reduction.

REFERENCES

- Advance CTE (n. d.). *Career clusters*. <https://careertech.org/career-clusters>.
- Agodini, R., & Deke, J. (2004). *The relationship between high school vocational education and dropping out*. Mathematica Policy Research.
- Alexander, K. L., Entwisle, D. R., & Horsey, C. S. (1997). From first grade forward: Early foundations of high school dropout. *Sociology of Education*, 70(2), 87-107. DOI: <https://doi.org/10.2307/2673158>
- Aliaga, O. A. (2022). Stakeholders' perceptions of career and technical education. *International Journal of Vocational Education and Training*, 27(1), 31-57.
- Aliaga, O. A. (2023). An analytical framework to measure participation in secondary career and technical education. *Career and Technical Education Research*, 48(2), 19-38. DOI: 10.5328/cter48.2.19
- Aliaga, O. A., Kotamraju, P., & Stone, J. R., III. (2012). *A typology for understanding the career and technical education credit-taking experience of high school students*. National Research Center for Career and Technical Education.
- Aliaga, O. A., Kotamraju, P., & Stone, J. R., III. (2014). Understanding participation in secondary career and technical education in the 21st century: Implications for policy and practice. *High School Journal*, 97(3), 128-158. DOI: 10.1353/hsj.2014.0002
- American Institutes for Research. (2013). *How career and technical education can help students be college and career ready: A primer*. <https://www.aypf.org/wp-content/uploads/2013/04/CCRS-CTE-Primer-2013.pdf>
- Applefield, J. M., Huber, R., & Moallem, M. (2000). Constructivism in theory and practice: Toward a better understanding. *The High School Journal*, 84(2), 35-53. DOI: <https://www.jstor.org/stable/40364404>
- Archambault, I., Janosz, M., Fallu, J.-S., & Pagani, L. S. (2009). Student engagement and its relationship with early high school dropout. *Journal of Adolescence*, 32, 651-670. DOI: 10.1016/j.adolescence.2008.06.007
- Audas, R., & Willms, D. (2001). *Engagement and dropping out of school: A life-course perspective*. Human Resource Development Canada.
- Battin-Pearson, S., Newcomb, M. D., Abbott, R. D., Hill, K. G., Catalano, R. F., & Hawkins, J. D. (2000). Predictors of early high school dropout: A test

- of five theories. *Journal of Educational Psychology*, 92(3), 568–582. DOI: 10.1037//0022-0663.92.3.568
- Behnke, A. O., Gonzalez, L. M., & Cox, R. B. (2010). Latino students in new arrival states: Factors and services to prevent youth from dropping out. *Hispanic Journal of Behavioral Sciences*, 32(3), 385–409. DOI: 10.1177/0739986310374025
- Belfield, C. R., Levin, H. M., & Rosen, R. (2012). The economic value of opportunity youth. *Center for Benefit-Cost Studies of Education*, 32.
- Bishop, J. H., & Mane, F. (2004). The impacts of career-technical education on high school labor market success. *Economics of Education Review*, 23, 381–402. DOI: <https://doi.org/10.1016/j.econedurev.2004.04.001>
- Blowe, E. H., & Price, T. (2012). Career and technical education: Academic achievement and graduation rates of students in the Commonwealth of Virginia. *SAGE Open*, 2(3), 2158244012455437. DOI: <https://doi.org/10.1177/2158244012455437>
- Borg, W. R., & Gall, M. D. (1983). *Educational research: An introduction* (4th ed.). Longman.
- Bowers, A. J., Sprott, R., & Taff, S. A. (2013). Do we know who will drop out? A review of the predictors of dropping out of high school: Precision, sensitivity, and specificity. *The High School Journal*, 96(2), 77–100. DOI: <https://doi.org/10.1353/hsj.2013.0000>
- Bozick, R., & Dalton, B. (2013). *Career and technical education and academic progress at the end of high school: Evidence from the Education Longitudinal Study of 2002*. RTI.
- Bridgeland, J. M., Dilulio, J. J., Jr., & Morison, K. B. (2006). *The silent epidemic: Perspectives of high school dropouts*. Civic Enterprises.
- Brunner, E. J., Dougherty, S. M., & Ross, S. L. (2021). The effects of career and technical education: Evidence from the Connecticut technical high school system. *The Review of Economics and Statistics*, 1–46. DOI: https://doi.org/10.1162/rest_a_01098
- Burhanuddin, N. A., Ahmad, N. A., Said, R. R., & Asimiran, S. (2021). Learning theories: Views from behaviourism theory and constructivism theory. *International Journal of Academic Research in Progressive Education and Development*, 10(1). DOI: <https://doi.org/10.6007/IJARPED/v10-i1/8590>
- Campbell, P. B., & Laughlin, S. (1988). *Participation in vocational education: An overview of patterns and their outcomes*. National Center for Research in Vocational Education.
- Castellano, M., Stringfield, S., & Stone, J. R., III. (2003). Secondary career and technical education and comprehensive school reform: Implications for research and practice. *Review of Educational Research* 73 (2), 231–272. <https://www.jstor.org/stable/3516092>
- Castellano, M., Stone, J. R., III, Stringfield, S., Farley-Ripple, E. N., Overman, L. T., & Hussain, R. (2007). *Career-based comprehensive high school reform:*

- serving disadvantaged youth in minority communities. National Research Center for Career and Technical Education.
- Castellano, M., Richardson, G. B., Sundell, K., & Stone, J. R. (2017). Preparing students for college and career in the United States: The effects of career-themed programs of study on high school performance. *Vocations and Learning*, 10(1), 47–70. DOI: <https://doi.org/10.1007/s12186-016-9162-7>
- Catterall, J. S., & Stern, D. (1986). The effects of alternative school programs on high school completion and labor market outcomes. *Educational Evaluation and Policy Analysis*, 8(1), 77–86. DOI: <https://doi.org/10.2307/1163822>
- Christle, C. A., Jolivette, K., & Nelson, C. M. (2007). School characteristics related to high school dropout rates. *Remedial and Special Education*, 28(6), 325–339. DOI: <https://doi.org/10.1177/07419325070280060201>
- Cohen, M., & Besharov, D. J. (2004). *The important role of career and technical education: Implications for federal policy*. Welfare Reform Academy Report.
- Conchas, G. Q., & Clark, P. A. (2002). Career academies and urban minority schooling: Forging optimism despite limited opportunity. *Journal of Education for Students Placed at Risk*, 7(3), 287–311. https://doi.org/10.1207/S15327671ESPR0703_1
- Cushing, E., English, D., Therriault, S., & Lavinson, R. (2019). *Developing a college- and career-ready workforce: An analysis of ESSA, Perkins V, IDEA, and WIOA*. American Institutes for Research.
- Day, J. C., & Newburger, E. C. (2002). *The big payoff: Educational attainment and synthetic estimates of work-life earnings*. U.S. Bureau of the Census.
- DeFalco, A. (2016). Dewey and vocational education. Still timely? *The Journal of School & Society*, 3(1), 54–64.
- Diehl, D. (2020). It's good until it's not: The curvilinear relationship between affective school engagement and career and technical education participation. *Career and Technical Education Research*, 45(3), 45–62. DOI: 10.5328/cter45.3.45
- Doll, J. J., Eslami, Z., & Walters, L. (2013). *Understanding why students drop out of high school, according to their own reports*. SAGE Open.
- Doolittle, P. E., & Camp, W. G. (1999). Constructivism: The career and technical education perspective. *Journal of Vocational and Technical Education*, 16(1), 23–46.
- Dougherty, S. M. (2018). The effect of career and technical education on human capital accumulation: Causal evidence from Massachusetts. *Education Finance and Policy*, 13(2), 119–148. DOI: 10.1162/EDFP_a_00224
- Dougherty, S. M., Grindal, T., & Hehir, T. (2018). The impact of career and technical education on students with disabilities. *Journal of Disability Policy Studies*, 29(2), 108–118. <https://doi.org/10.1177/1044207318771673>
- Fortin, L., Marcotte, D., Diallo, T., Potvin, P., & Royer, É. (2013). A multidimensional model of school dropout from an 8-year longitudinal study in a general high school population. *European Journal of Psychology of Education*, 28, 563–583. DOI 10.1007/s10212-012-0129-2

- Fosnot, C.T. (1996). *Constructivism: Theory, perspective, and practice*. Teachers College Press.
- Fox, J. (2002). *Cox proportional-hazards regression for survival analysis: Appendix to An R and S-Plus companion to applied regression*. SAGE.
- Gottfried, M. (2022). Linking applied STEM coursetaking beyond STEM outcomes: Examining high school completion and college-going behavior. *The High School Journal*, 105(3), 175-198.
- Gottfried, M. A., & Plasman, J. S. (2018). Linking the timing of career and technical education coursetaking with high school dropout and college-going behavior. *American Educational Research Journal*, 55(2), 325-361. <https://www.jstor.org/stable/26643541>
- Griffin, B. W. (2002). Academic disidentification, race, and high school dropouts. *High School Journal*, 85(4), 71-81. DOI: <https://doi.org/10.1353/hsj.2002.0008>
- Harris, D. N., & Chen, F. (2022). *How has the pandemic affected high school graduation and college entry?* Brookings Institution. <https://www.brookings.edu/blog/brown-center-chalkboard/2022/05/10/how-has-the-pandemic-affected-high-school-graduation-and-college-entry/>
- Hemelt, S. W., Lenard, M. A., & Paepelow, C. G. (2019). Building bridges to life after high school: Contemporary career academies and student outcomes. *Economics of Education Review*, 68, 161-178. DOI: <https://doi.org/10.1016/j.econedurev.2018.08.005>
- Hong, B. A., Pollio, D. E., Downs, D. L., Coyne, D. W., & North, C. S. (2022). Groundhog Day: Research without old data and old references. *Psychological Medicine*, 52(4), 625-631. DOI: <https://doi.org/10.1017/S0033291722000216>
- Hougaard, P. (2000). *Analysis of multivariate survival data*. Springer.
- Imperatore, C., & Hyslop, A. (2017). CTE policy past, present, and future: Driving forces behind the evolution of federal priorities. *Peabody Journal of Education*, 92(2), 275-289. DOI: 10.1080/0161956X.2017.1302221
- Janosz, M., Archambault, I., Morizot, J., & Pagani, L. S. (2008). School engagement trajectories and their differential predictive relations to dropout. *Journal of Social Issues*, 64(1), 21-40. DOI: <https://doi.org/10.1111/j.1540-4560.2008.00546.x>
- Jimerson, S., Egeland, B., Sroufe, L. A., & Carlson, B. (2000). A prospective longitudinal study of high school dropouts examining multiple predictors across development. *Journal of School Psychology*, 38(6), 525-549. DOI: [https://doi.org/10.1016/S0022-4405\(00\)00051-0](https://doi.org/10.1016/S0022-4405(00)00051-0)
- Kaufman, P., McMillen, M., & Sweet, D. (1996). *A comparison of high school dropout rates in 1982 and 1992*. National Center for Education Statistics.
- Kemple, J. J., Unterman, R., & Dougherty, S. M. (2023). *NYC as a laboratory for learning about career and technical education: Lessons from CTE-dedicated high schools*. The Research Alliance for New York City Schools. <https://>

- www.mdrc.org/sites/default/files/NYC_As_A_Lab_For_Learning_About_CTE_FINAL_revised_cover_1.24.pdf
- Lulik, J. A. (1998). Curricular tracks and high school vocational education. In A. Gamoran (Ed.), *The quality of vocational education: Background papers from the 1994 National Assessment of Vocational Education* (pp.65–131) U.S. Department of Education.
- Levesque, K., Laird, J., Hensley, E., Choy, S.P., Cataldi, E.F., & Hudson, L. (2008). *Career and technical education in the United States: 1990 to 2005. Statistical analysis report*. (NCES 2008-035). National Center for Education Statistics.
- Lewis, M. V. (2008). Effectiveness of previous initiatives similar to programs of study: Tech Prep, career pathways, and youth apprenticeships. *Career and Technical Education Research*, 33(3), 165-188.
- Lynch, R. L. (2000). High school career and technical education for the first decade of the 21st century. *Journal of Vocational Education Research*, 25(2), 155-198.
- Manzuoli, C. H., Pineda-Báez, C., & Vargas Sánchez, A. D. (2019). School engagement for avoiding dropout in middle school education. *International Education Studies*, 12(5), 35-48. DOI:10.5539/ies.v12n5p35
- Marques, L. A. (2017). Theoretical foundations of vocational and technical education and the part they play in the process of state building. In M. E. Auer & K.-S. Kim (Eds.), *Engineering education for a smart society. World Engineering Education Forum & Global Engineering Deans Council 2016* (179-190). Springer.
- McCormick, A. C., & Tuma, J. (1995). *Vocational course taking and achievement: An analysis of high school transcripts and 1990 NAEP assessment scores*. National Center for Education Statistics.
- McFarland, J., Stark, P., and Cui, J. (2016). *Trends in high school dropout and completion rates in the United States: 2013* (NCES 2016-117). National Center for Education Statistics. <https://files.eric.ed.gov/fulltext/ED569943.pdf>
- Mertens, D. M. (1998). *Research methods in education and psychology: Integrating diversity with quantitative & qualitative approaches*. SAGE.
- Mertens, D. M., Seitz, P., & Cox, S. (1982). *Vocational education and the high school dropout*. National Center for Research in Vocational Education.
- Michaels, C., & Barone, D. (2020). Career and technical education: Academic achievement as measured by national testing. *Career and Technical Education Research*, 45(3), 3-19. DOI: 10.5328/cter45.3.3
- Moscoviz, L., & Evans, D. K. (2022). *Learning loss and student dropouts during the COVID-19 pandemic: A review of the evidence two years after schools shut down. Working Paper 609*. Center for Global Development.
- National Assessment of Educational Progress (2023). *The nation's report card*. <https://www.nationsreportcard.gov/highlights/ltr/2023/>

- National Assessment of Vocational Education Independent Advisory Panel (2004). *Earning, learning and choice. Career and technical education works for students and employers*. U.S. Department of Education.
- National Center for Education Statistics. (n. d.). *Career and technical education statistics. Tables: Secondary/high school. Table H186*. <https://nces.ed.gov/surveys/ctes/tables/index.asp?LEVEL=SECONDARY>.
- National Center for Education Statistics. (2010). *Education Longitudinal Study of 2002 (ELS:2002)*. <http://nces.ed.gov/surveys/els2002/>.
- National Center for Education Statistics. (2012). *ELS: 2012 student codebook*.
- National Center for Education Statistics. (2022a). *Digest of Education Statistics. Table 219.71*. https://nces.ed.gov/programs/digest/d22/tables/dt22_219.71.asp?current=yes
- National Center for Education Statistics. (2022b). *Digest of Education Statistics. Table 219.70*. https://nces.ed.gov/programs/digest/d22/tables/dt22_219.70.asp?current=yes
- National Center for Education Statistics. (2022c). *Digest of Education Statistics. Table 219.73*. https://nces.ed.gov/programs/digest/d22/tables/dt22_219.73.asp?current=yes
- National Center for Education Statistics. (2022d). *Digest of Education Statistics. Table 502.30*. https://nces.ed.gov/programs/digest/d22/tables/dt22_502.30.asp
- Neild, R. C., Boccanfuso, C., & Byrnes, V. (2015). Academic impacts of career and technical schools. *Career and Technical Education Research*, 40(1), 28-47. DOI: 10.5328/cter40.1.28
- O'Connell, M., & Sheikh, H. (2009). Non-cognitive abilities and early school dropout: Longitudinal evidence from NELS. *Educational Studies*, 35(4), 475-479. DOI: <https://doi.org/10.1080/03055690902876586>
- Patton, W. (2005). A postmodern approach to career education: What does it look like? *Perspectives in Education*, 23(2), 21-28.
- Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Prentice Hall.
- Piscitello, J., Kim, Y. K., Orooji, M., & Robison, S. (2022). Sociodemographic risk, school engagement, and community characteristics: A mediated approach to understanding high school dropout. *Children and Youth Services Review*, 133, 1-9. DOI: <https://doi.org/10.1016/j.childyouth.2021.106347>
- Plank, S. (2001). *Career and technical education in the balance: An analysis of high school persistence, academic achievement, and postsecondary destinations*. National Research Center for Career and Technical Education.
- Plank, S., DeLuca, S., & Estacion, A. (2008). High school dropout and the role of career and technical education: A survival analysis of surviving high school. *Sociology of Education*, 81, 345-370. <https://www.jstor.org/stable/20452745>

- Pong, S.-L., & Ju, D.-B. (2000). The effects of change in family structure and income on dropping out of middle and high school. *Journal of Family Issues*, 21(2), 147-169. DOI: <https://doi.org/10.1177/019251300021002001>
- Richardson, V. (2003). Constructivist pedagogy. *Teachers College Record*, 105(9), 1623-1640. DOI: <https://doi.org/10.1177/016146810310500906>
- Robison, S., Jagers, J., Rhodes, J., Blackmon, B. J., & Church, W. (2017). Correlates of educational success: Predictors of school dropout and graduation for urban students in the Deep South. *Children and Youth Services Review*, 73, 37-46. DOI: <https://doi.org/10.1016/j.childyouth.2016.11.031>
- Rumberger, R. W. (1983). Dropping out of high school: The influence of race, sex, and family background. *American Educational Research Journal*, 20(2), 199-220. DOI: <https://doi.org/10.3102/00028312020002199>
- Rumberger, R. W. (2011). *Dropping out: Why students drop out of high school and what can be done about it*. Harvard University Press.
- Rumberger, R. W., & Arellano, B. (2007). *Student and school predictors of high school graduation in California*. California Dropout Research Project.
- Rumberger, R. W. & Rotermund, S. (2012). The relationship between engagement and high school dropout. In S. Christenson, A. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 491-513). Springer.
- Schargel, F. P., & Smink, J. (2001). *Strategies to help solve our school dropout problem*. Eye on Education.
- Silverberg, M., Warner, E., Fong, M., & Goodwin, D. (2004). *National Assessment of Vocational Education: Final report to Congress*. U.S. Department of Education.
- Smith-Hughes Act. Publ. L. No. 64-347 (1917). <https://www.loc.gov/law/help/statutes-at-large/64th-congress/session-2/c64s2ch114.pdf>.
- Steffe, L.P., & Gale, J. (Eds.) (1995). *Constructivism in education*. Erlbaum.
- Stone, J. R. III. (2009) Keeping kids on track to a successful adulthood: The Role of VET in improving high school outcomes. In A. Furlong (ed.), *The international handbook of youth and young adulthood: New perspectives and agendas*. (pp. 135-143). Routledge.
- Stone, J. R. III (2014). A conceptual framework for the American labor market: Engagement, achievement and transition. In L. Archer, A. Mann, & J. Stanley (Eds). *Understanding employer engagement in education: Theories and evidence*. Routledge.
- Stone, J. R., III, & Aliaga, O. A. (2007, April). *Re-defining career and technical education participation*. Paper presented at the 2007 American Educational Research Association Annual Meeting, Chicago, IL.
- Strengthening Career and Technical Education for the 21st Century Act. Publ. L. No. 115-224 (2018). <https://www.congress.gov/115/plaws/publ224/PLAW-115publ224.pdf>.

- Suh, S., Suh, J., & Houston, I. (2007). Predictors of categorical at-risk high school dropouts. *Journal of Counseling and Development, 85*(2), 196-203. DOI: 10.1002/j.1556-6678.2007.tb00463.x
- Swanson, C. B. (2009). *Cities in crisis 2009. Closing the graduation gap: Educational and economic conditions in America's largest cities*. Editorial Projects in Education. <https://epe.brightspotcdn.com/11/c9/ce165102486a982aeddfe8446fa/cities-in-crisis-2009.pdf>
- Theobald, R. J., Goldhaber, D. D., Gratz, T. M., & Holden, K. L. (2019). Career and technical education, inclusion, and postsecondary outcomes for students with learning disabilities. *Journal of Learning Disabilities, 52*(2), 109-119. <https://doi.org/10.1177/0022219418775121>
- U.S. Department of Education (2014). *National Assessment of Career and Technical Education Final report*. https://s3.amazonaws.com/PCRN/uploads/NACTE_FinalReport2014.pdf
- Uretsky, M. C., (2019). High school completion in context: Student- and school-level factors related to on-time graduation. *Teachers College Record, 121*(10), 1-28. DOI: <https://doi.org/10.1177/016146811912101006>
- Wood, L., Kiperman, S., Esch, R. C. Leroux, A. J., & Truscott, S. D. (2017). Predicting dropout using student- and school-level factors: An ecological perspective. *School Psychology Quarterly, 32*(1), 35-49. <http://dx.doi.org/10.1037/spq0000152>
- Xing, & Gordon, H. R. D. (2021). Mediating effects of school engagement between high school on-time completion and career and technical education. *Vocations and Learning, 14*(1), 1-21. DOI: <https://doi.org/10.1007/s12186-020-09252-2>
- Young, J. W., Cline, F., King, T. C., Jackson, A. D., & Timberlake, A. (2011). *High Schools That Work: Program description, literature review, and research findings*. Educational Testing Service.

Table 1
 CTE Credit-Taking Experience of Public High School Students.
 ELS:2002. (Restricted File)

Original Classification			Classification for this Study		
		%			%
1	No CTE credits	8.0	1	Less than 3 CTE credits	56.1
2	More than 0 and less than 1 CTE credits	7.5			
3	1 CTE credit	10.7			
4	More than 1 and less than 3 CTE credits	29.9			
5	3 CTE credits, no occupational area fulfilled	7.6	2	3 CTE credits of more, no occupational area fulfilled	27.2
6	More than 3 CTE credits, no occupational area fulfilled	19.6			
7	3 CTE credits, 1 occupational area fulfilled	0.8	3	3 CTE credits or more, one or more occupational area fulfilled	16.8
8	More than 3 credits, at least 1 occupational area fulfilled	16.0			
TOTAL		100.0	TOTAL 100.0		

Source: Aliaga, Kotamraju & Stone (2014)

Table 2

High School GPA, by Selected Variables (Percentages). ELS:2002.
(Public File). Chi-Square

	GPA for All Courses Taken in the 9th - 12th Grades							Total
	0.00 - 1.00	1.01 - 1.50	1.51 - 2.00	2.01 - 2.50	2.51 - 3.00	3.01 - 3.50	3.51 - 4.00	
Gender								
Female	0,8	2,1	4,9	8,6	11,0	11,7	11,0	49,9
Male	1,5	3,8	8,0	10,9	10,7	9,2	6,0	50,1
Race								
Amer. Indian/Alaska Native	0,0	0,1	0,1	0,3	0,2	0,1	0,1	1,0
Asian, Hawaii/Pac. Islander	0,1	0,1	0,3	0,5	0,8	1,0	1,2	4,1
African American	0,9	1,5	3,0	3,5	2,9	1,6	0,5	13,7
Hispanic	0,6	1,5	3,1	3,7	3,2	2,3	1,2	15,7
More than one race	0,1	0,3	0,6	0,8	1,0	0,8	0,4	4,1
White	0,6	2,3	5,8	10,6	13,6	15,0	13,6	61,5
Socio-Economic Status								
Lowest quartile	1,0	2,3	4,8	5,9	5,2	3,3	1,8	24,4
Second quartile	0,9	1,9	3,9	5,4	5,5	4,5	3,1	25,1
Third quartile	0,3	1,2	2,7	4,8	5,7	6,1	4,3	25,1
Highest quartile	0,1	0,5	1,5	3,4	5,2	6,9	7,8	25,4
Student Prior Achievement								
Math Quartile 10th Grade - Low	1,3	2,9	5,6	6,7	4,4	1,9	0,3	23,1
Math Quartile 10th Grade	0,6	2,0	4,4	6,2	6,2	4,3	1,5	25,2
Math Quartile 10th Grade	0,3	0,8	2,0	4,5	6,6	6,8	4,7	25,8
Math Quartile 10th Grade - High	0,0	0,2	0,8	2,0	4,5	7,8	10,5	25,9
Expectation of Education								
Don't know	0,5	1,0	2,0	2,6	1,8	1,0	0,3	9,2
Less than high school	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,4
GED or other	0,3	0,4	0,4	0,3	0,1	0,0	0,0	1,4
High school only	0,2	0,5	1,4	1,4	0,8	0,4	0,1	4,8
Attend/complete 2-year college	0,6	1,5	3,1	4,6	3,5	1,8	0,5	15,5
Attend/complete 4-year college	0,4	1,6	4,0	7,0	8,7	8,6	5,4	35,7
Master's degree or equivalent	0,1	0,5	1,2	2,2	4,3	5,9	6,1	20,3
Doctoral/advanced degree	0,1	0,3	0,7	1,3	2,5	3,1	4,6	12,6
School Location								
Urban	1,1	2,3	4,0	5,8	5,9	5,3	4,3	28,7
Suburban	0,9	2,6	6,4	9,6	11,6	11,2	9,1	51,5
Rural	0,2	1,0	2,5	4,1	4,1	4,3	3,6	19,8

All relations statistically significant at $p < .001$

Table 3

High School Dropouts, by Selected Variables (Percentages).

ELS:2002. (Public File). Chi-Square

	Dropout Status				Total
	Not dropout	Dropout	Prior dropout	Alternative completer	
Gender					
Female	45,7	2,9	0,6	0,5	49,7
Male	45,0	3,7	0,9	0,7	50,3
Race					
Amer. Indian/Alaska Native	0,9	0,0	0,0	0,0	1,0
Asian, Hawaii/Pac. Islander	4,0	0,1	0,1	0,0	4,2
African American	12,3	1,4	0,5	0,1	14,4
Hispanic	13,7	1,8	0,3	0,2	16,1
More than one race	3,6	0,3	0,1	0,1	4,1
White	56,2	2,9	0,5	0,7	60,3
Socio-Economic Status					
Lowest quartile	20,5	3,2	0,6	0,4	24,8
Second quartile	22,3	1,9	0,4	0,3	25,0
Third quartile	23,6	1,0	0,3	0,2	25,2
Highest quartile	24,3	0,4	0,2	0,2	25,1
Student Prior Achievement					
Math Quartile 10th Grade - Low	19,5	3,2	0,6	0,3	23,7
Math Quartile 10th Grade	22,2	2,2	0,5	0,5	25,3
Math Quartile 10th Grade	24,1	0,9	0,3	0,3	25,6
Math Quartile 10th Grade - High	24,8	0,3	0,1	0,2	25,4
Expectation of Education					
Don't know	7,5	2,0	0,2	0,0	9,7
Less than high school	0,3	0,2	0,0	0,0	0,4
GED or other	0,6	1,0	0,0	0,1	1,7
High school only	4,3	0,3	0,1	0,2	4,9
Attend/complete 2-year college	13,5	1,5	0,3	0,2	15,4
Attend/complete 4-year college	33,3	1,3	0,5	0,4	35,5
Master's degree or equivalent	19,6	0,3	0,3	0,1	20,3
Doctoral/advanced degree	11,8	0,2	0,1	0,1	12,2
School Location					
Urban	26,2	2,7	0,7	0,4	30,0
Suburban	46,4	2,7	0,6	0,5	50,2
Rural	18,0	1,2	0,2	0,3	19,7

All relations statistically significant at $p < .001$

Table 4

High School Dropouts, by Cumulative 9th-12th Grades GPA
(Percentages). ELS:2002. (Public File). Chi-Square

	Dropout Status				Total
	Not dropout	Dropout	Prior dropout	Alternative completer	
Cumulative GPA 9th-12th Grade					
0.00 - 1.00	0,9	1,2	0,1	0,1	2,3
1.01 - 1.50	3,4	1,9	0,3	0,2	5,9
1.51 - 2.00	10,6	1,5	0,4	0,4	12,9
2.01 - 2.50	18,1	0,9	0,3	0,2	19,5
2.51 - 3.00	21,1	0,3	0,2	0,1	21,7
3.01 - 3.50	20,6	0,1	0,1	0,0	20,8
3.51 - 4.00	16,9	0,0	0,1	0,0	17,0

All relations statistically significant at $p < .001$

Table 5

Model Estimates of a Survival Model for Career and Technical Education Credit-Taking and Dropping Out of High School. ELS:2002 (Restricted File)

Predictor	<i>Exp(B)</i>	Sig.
Gender (Female. Reference: Male)	0.817	0.288
Age	1.041	0.000
Socioeconomic Status (Reference: Highest quartile)	0.687	0.01
9th-Grade GPA	0.272	0.000
CTE Credit Taking (Reference group: Less than 3 CTE credits)		0.012
3 or more CTE credits, No Focus on Occupational Area	0.644	0.045
3 or more CTE cr, Focus on Occupational Area	0.495	0.009
Cases in Analysis		
Event	120	
Censored	9123	
Total	9243	
Chi-Square	234.916	
<i>df</i>	6	
Sig	0.000	

Figure 1.
Hazard function of dropping out and CTE credit-taking categories
ELS:2002 (Restricted File)

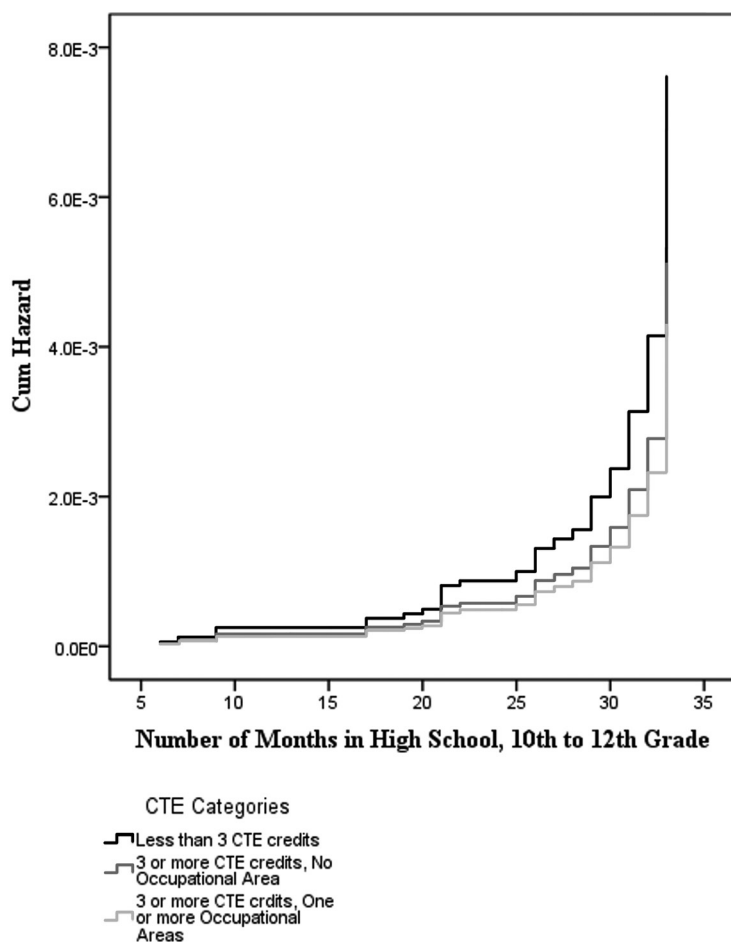


Table 6

Model Estimates of a Survival Model for Career and Technical Education Credit-Taking and Dropping Out of High School, by Gender. ELS:2002 (Restricted File)

Predictor	Male		Female	
	<i>Exp(B)</i>	Sig.	<i>Exp(B)</i>	Sig.
Age	1.044	0.002	1.051	0.009
9th-Grade GPA	0.267	0.000	0.243	0.000
CTE Credit Taking (Reference: Less than 3 CTE credits)		0.007		0.692
3 or more CTE credits, No Focus on Occupational Area	0.615	0.080	0.736	0.391
3 or more CTE cr, Focus on Occupational Area	0.305	0.004	0.914	0.809
Cases in Analysis				
Event	72		48	
Censored	4358		4765	
Total	4430		4813	
Chi-Square	123.947		90.743	
<i>df</i>	4		4	
Sig	0.000		0.000	

The Overview of TVET-Engineering Landscape in Malaysia

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ABSTRACT

The expansion in Malaysian development has increased the demand for TVET graduates to supply a competent workforce at various levels, especially in the technology and engineering discipline. The TVET system is supposed to be fundamentally designed to meet projected labour market demands in the industry. However, in Malaysia, the skills mismatch between industry graduates produced by the institutions continues to be critical. This is due to the lack of a fragmented TVET system, which leads to the lack of recognition for TVET graduates as professionals. At the same time, the limited industries collaboration in the Malaysian TVET system influenced the low numbers of employment among TVET graduates, which is currently below the national target. Moreover, TVET graduates are perceived to be average at best and earn low wages, leading to the disbursement of competence. Therefore, BEM and MBOT have stepped forward, focusing on improving technology-based professional programs in Malaysia. These two professional organi-

sations have developed education and career pathways for Engineering technology and Technology programs and graduates to ensure that TVET institutions can produce a skilled workforce to accommodate the country's labour market needs. This article will deliberate the overview of TVET-Engineering in Malaysia, which has been argued over time.

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KEYWORDS

TVET-Engineering, professional technologist, MBOT, ETAC

INTRODUCTION

TVET is crucial for developing countries in preparation for the 21st-century skills demand. As one of the developing countries, Malaysia is actively engaged in producing a skilled workforce to accommodate the country's labour market needs. The Malaysian government is committed to strengthening the field of TVET in Malaysia to meet the desire to improve the economy in the value chain to become a high-income economy country. This may be observed in the Malaysia Plan series, where ILKA allocation grew from RM1.9 billion in the Seventh Malaysia Plan (7MP) 1996 to 2000 to RM3.8 billion in the Eighth Malaysia Plan (8MP) 2001 to 2005 (Economic Planning Unit, 2003). The Tenth Malaysia Plan (10MP) for 2011 to 2015 also reflected a substantial shift, with new initiatives such as mainstreaming TVET education and increasing graduate study competency to make them more employable (Economic Planning Unit, 2010). Furthermore, the government has strengthened the TVET eco-

system through the 12MP, which will create future available talent as a driver of change to satisfy industrial demands better.

A robust TVET ecosystem will enable Malaysia to address persistent challenges such as reliance on foreign workers and low student results as a vital accelerator in the country's socio-economic growth. The adoption of all of these initiatives will result in a more flexible labour market, which will help to raise people's living standards. TVET refers to the program designed mainly to prepare students with skills for entry into a particular occupation or trade (or class of professions or trades) (UNESCO, 2014). The World Bank (2011) highlighted that TVET graduates could meet the job demand and better command high-income jobs. Also, with rapid changes in technology, engineering technology has become one of the preferred disciplines in Malaysia (Sulaiman et al., 2015).

Engineering education and engineering technology education are recognised as part of TVE (Haas, 1999). Engineering education is often perceived as imparting valuable engineering concepts and vast theoretical knowledge coupled with matching practical skills. Which, given by producing engineering graduates who can play a dynamic role in shaping the future technological society (Paramasivam and Muthusamy, 2012). Meanwhile, an engineering technology program that can provide a competent and high-skilled workforce has become crucial and more demanding from the industry. There is an interface between engineering technology and engineering people in the workplace whereby technologists focus more on application and implementation while engineers focus on research and development (Beute & Matlala, 2007).

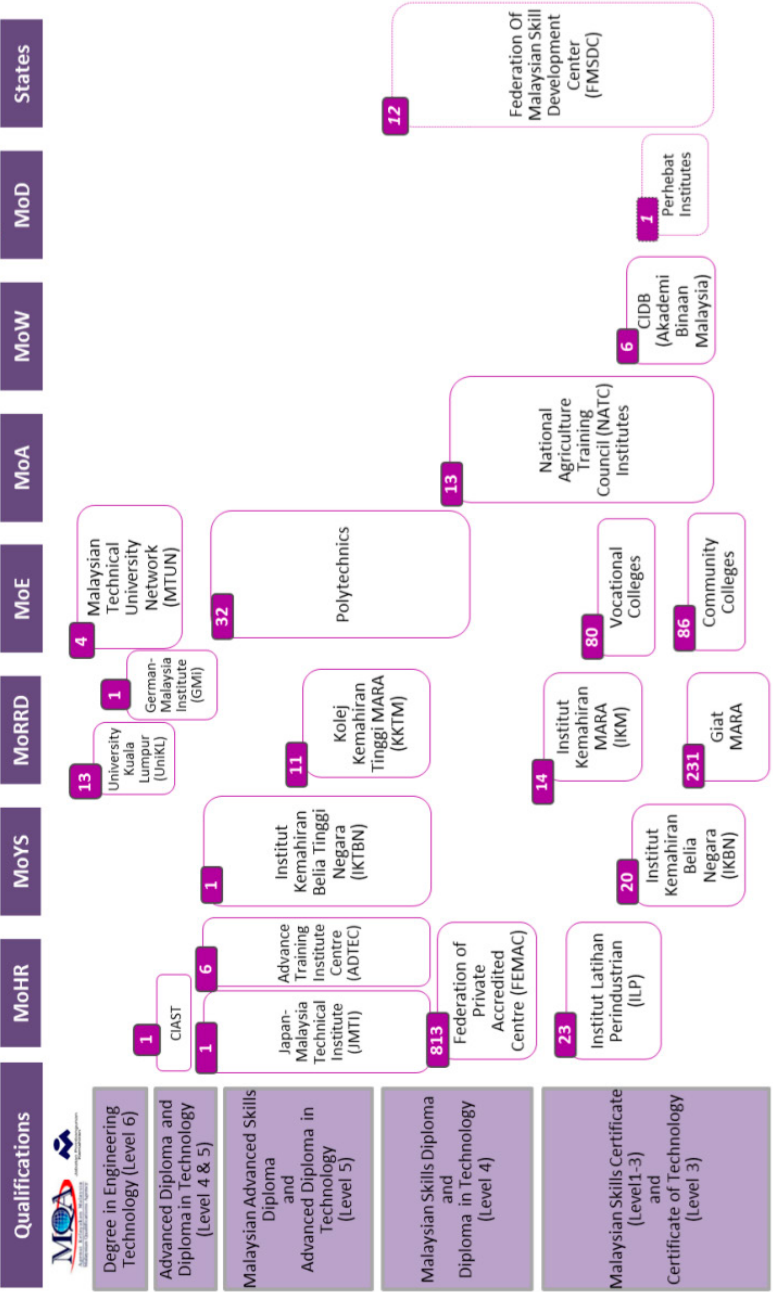
CHALLENGES IN MALAYSIAN TVET ECOSYSTEM

Limited coordination and fragmented TVET system contributed to the lack of standardised performance data among TVET institutions. Moreover, the lack of recognition from the Malaysian government contributed to collaboration hesitation from the industries in the TVET system. It can be observed that the issues and problems plaguing the Malaysian TVET system are contributed mainly by the lack of involvement and collaboration by the industry within the TVET ecosystem. Enterprises, government TVET related, and TVET institutions are working in a silo and have caused issues in the labour market comprising (Institute of Labour Market Information and Analysis, 2018):

1. Skill gap and poor high-income job among skilled workers.
2. Graduates unemployment and dropout among youth.
3. Dependency on low skilled foreign labour
4. Issues on equality and salary gaps
5. Labor market regulation lowers industrial engagement and focuses on ease of doing.

It is expected, by 2030, up to an additional 344 million jobs will be created in addition to the existing 190 million job placement to address current unemployment, with 64.8 million of it representing the youth (International Labour Office, 2018). Meanwhile, it is expected that only 30.1% or equal to 46 million employment for a skilled worker will be created in the year 2020 (Economic Planning Unit, 2018). Hence, employment

Figure 1 Malaysian TVET institutions and qualification
(Source: Economic Planning Unit, 2015)



estimated by Major Occupational Level for the engineering field is expected to be around 202 million by 2030, suggesting that a mismatch in workforce forecast will create future problems for the increasing labour market. Part of this issue is believed to be contributed by the industries' poor recognition and perception of TVET-based qualifications and careers (Ismail & Abiddin, 2014). This is partly added by the highly fragmented landscape of TVET, with multiple ministries and agencies issuing certifications, which has caused many employers to face problems recognising the certification (Majumdar (2011); Pang (2011); Zain (2011)).

It is believed that certification institutions, departments, and TVET certifications create confusion among employers about the level of the quality, and there is no framework in determining the starting salary, which has proven a challenge to the employers (Yaakob, 2017). These issues emerge as there is no structured platform to capture the needs and challenges of the industries and has created uncertainty in the systems. In addition, various TVET providers often operate in silos, resulting in programs overlapping and creating confusion among students and employers (Ismail dan Abiddin, 2014). The significant overlap between the programs resulted in poor coordination and duplication of responsibilities in calibrating learning outcomes for TVET education (Mohd Amin, 2016).

In the TVET curriculum, a balanced curriculum shall include all technical and non-technical attributes. However, even though the TVET system is fundamentally designed to meet the labour market demands, the current TVET programs in Malaysia are primarily supply-driven and less emphasise matching training to available jobs (Ismail & Abiddin, 2014). Furthermore, the

lack of industry input in curriculum design has resulted in the mismatch of skills required by industry and the skills attained by TVET graduates (Yaakob, 2017).

The implementation of the curriculum of TVE for effective teaching and learning to take place in TVE institutions cannot be achieved without adequate provision and maintenance of facilities (Audu et al., 2013). There must be adequate teaching and learning facilities such as classrooms, learning support facilities, study areas, information resources (library), computing and information-technology systems, laboratories and workshops, and associate equipment. These facilities cater to multi-delivery modes in delivering technical and vocational education (Board of Engineers Malaysia, 2019). However, it is found that most TVET teaching and training materials are often outdated and not relevant to what is needed for specific skills development (Johanson and van Adams, 2004). Besides, Umar & Ma'aji (2010) warned that the facilities, equipment, and tools are not adequate to be used by the teeming number of TVE students acquisition skills in technical training programs. This insufficient will suffer and lead to the production of highly unskilled personnel who are unemployable and unproductive. Therefore, inadequate workshop facilities in TVE institutions deterred skill acquisition.

Zain (2011) also reported a demand-supply mismatch, contributing to unfilled employment vacancies in the industry. This is because the technical and vocational education apprentice products did not meet the quality standards, nor were they willing to work (Ab. Rahim & Ivan Hanafi, 2007; Asian Development Bank, 2006). Furthermore, a study done by Muhammad Khair et al. (2016) identified an inability of the engineer-

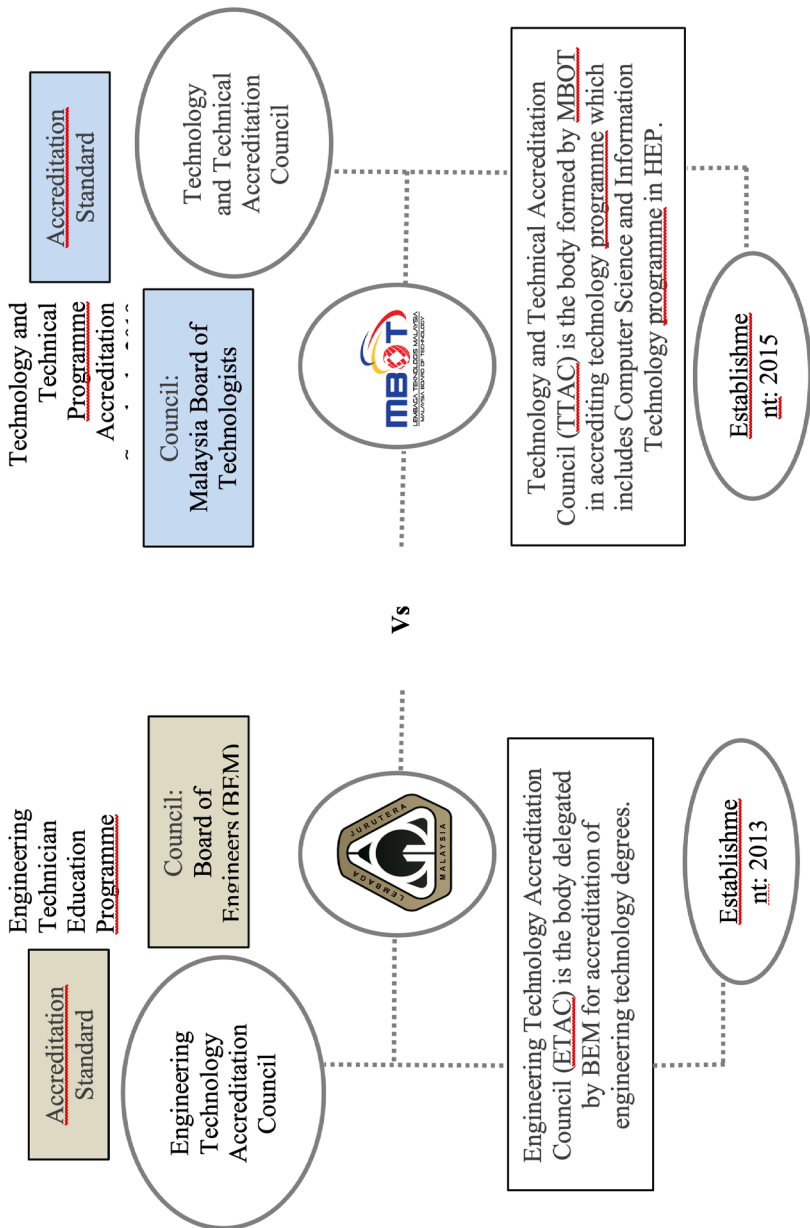
ing graduates to adapt in the industry field. Thus, the issue of low quality and quantity of skills trainees from the Malaysian technical education system should be addressed immediately to enhance investors' confidence in our country (Che Rus et al., 2015). Therefore, it is believed that vocational training institutions should train and transfer the skills in various fields of technical expertise and link their curriculum in undertaking social needs and improvements (Lam & Hassan, 2018).

MALAYSIAN TVET LANDSCAPE

TVET delivery is fragmented as it is offered by Government ministries and their agencies, universities, state skills development centres and privately owned institutions. There are 525 public training institutions under seven ministries, namely the MoHR, MoE, Ministry of Youth and Sports (MoYS), Ministry of Regional and Rural Development (MoRRD), Ministry of Agriculture and Agro-Based Industry (MoA), Ministry of Works (MoW) and

Ministry of Defence (MINDEF). These institutions continue to offer introduced programmes since their establishment and do not specialise based on their niche areas. In addition, there are 813 private institutions registered with DSD and 12 state skills development centres conducting TVET programmes with varying quality and standards. The Malaysian Technical University Network (MTUN) comprises four public universities, Universiti Malaysia Perlis, Universiti Malaysia Pahang, Universiti Teknikal Melaka, and Universiti Tun Hussein Onn, which offer degree qualifications TVET. Universiti Kuala Lumpur (UniKL) and German-Malaysia Institute (GMI) also pro-

Figure 2 Different accreditation bodies for Engineering Technology Program in Malaysia



Source: Technology and Technical Accreditation Council, 2019 & Malaysia Board Of Technologists, 2017

vide private TVET higher education. Figure 1 shows the various TVET institutions and qualifications offered in the Malaysian TVET landscape.

THE DEVELOPMENT OF ENGINEERING TECHNOLOGY PROGRAM IN MALAYSIA

The government recommended a school system with two academic and technical/vocational streams in 1979 (Recommendation (61)). The number of technical schools had risen by the conclusion of the 7th Malaysia Plan, and some of these students were required to pursue undergraduate degrees in technical and skills sectors. Because most universities only offered theoretical studies at the time, former technical and vocational students could only pursue studies until the diploma level if they chose a practice-based study model. Polytechnics, British Malaysia Institute (BMI), German Malaysia Institute (GMI), Malaysia France Institute (MFI), and Institut Kemahiran Mara all provide study programmes based on practical experience exclusively at the diploma level and below (IKM).

However, advancement to higher levels is quite limited. Moreover, most universities did not recognise technical and vocational studies. Thus, in June 1995, the University's Vice-Chancellor held a conference to discuss the need to provide opportunities for students in these technical and vocational streams and the necessity to recruit highly experienced engineers who can combine academic and practical elements. Creating a technical university was considered a proactive effort to address these demands.

Four university colleges focused on technical subjects have been formed as Model 2 Public Institutions of Higher Learning

to provide skilled workers who match the needs of industry, as a continuation of technical and vocational education, namely:

1. Tun Hussein Onn University of Technology College (KUITTHO),
2. National Technical University College of Malaysia (KUTKM),
3. University College of Engineering and Technology Malaysia (KUKTEM),
4. North Malaysia University College of Engineering and Technology (KUKTEM) (KUKUM).

On February 1, 2007, all of these university colleges were upgraded to universities, and the Malaysian Technical University Network (MTUN), which includes:

1. Universiti Tun Hussein Onn Malaysia, UTHM
2. Universiti Teknikal Malaysia Melaka, UTeM
3. Universiti Malaysia Pahang, UMP
4. Universiti Malaysia Perlis, UNIMAP

At the outset of MTUN's existence, the programme formed was an engineering programme. Because there was no clear professional body for graduates of engineering technology programmes at the time, MTUN created and offered engineering programmes, but with practice-oriented and training-oriented delivery and assessment techniques. This method is based on the University of Applied Sciences in Germany's model. The Engineering Accreditation Council accredits engineering programmes from 2005 onwards (EAC). These programmes, however, are unable to preserve their identity of delivery across training and practise due to the limits of the Engineering

Accreditation Council (EAC) standards, which necessitate theory-focused delivery.

In 2013, the BEM Engineering Technology Accreditation Council (ETAC) was established. In 2015, BEM amended their Registration of Engineers Act (1967) & its Regulations, which include engineering technologists and inspectors of work (technician) in the engineering team. Furthermore, Engineering Technician Education Program Accreditation Standard was developed in 2019, equating with Dublin Accord (2018), which this document is set as an accreditation reference. Under the Malaysia Qualifications Agency (MQA) Act, the Board of Engineering Malaysia (BEM) is fully empowered for accreditation of related study programs:

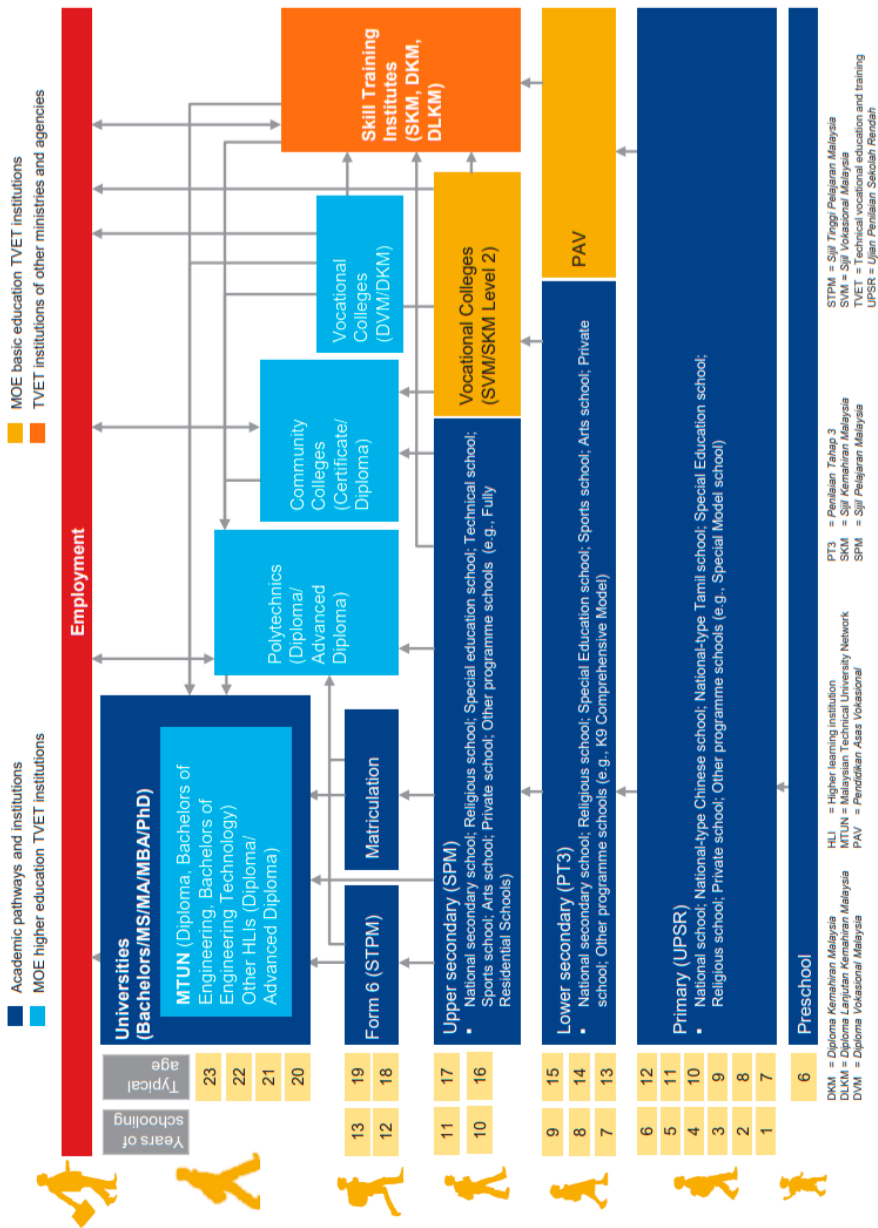
- ETAC-BEM is the Joint Technical Committee (JTC).
Articles 51-52 of the MQA Act
- Full mandate (except application process via MQA)

This means BEM has a full mandate over Diploma and Degree programs for engineering and engineering technology.

Malaysian Board of Technologies (MBOT) was created as a professional organisation under the Technologists and Technicians Act 2015 (Act 768) to register and recognise Professional Technologist and Certified technicians as professionals. According to Act 768, MBOT develops its function vertically and horizontally, focusing on technology-based professions ranging from conceptual design to realised technology and covering technicians (MQF Level 3 to Advanced Diploma Level) to technologists (Bachelor's Degree level and above).

Engineering technology programmes are accredited by BEM, while MBOT accredits technology programmes that do not

Figure 3 Education Pathways in Malaysia



Source: Pemandu Padu TVET Lab Study, 2014

contain engineering terms. This is to ensure that the law is followed and avoid duplication and confusion in the accreditation of TVET Engineering programmes.

TVET-ENGINEERING EDUCATION PATHWAY

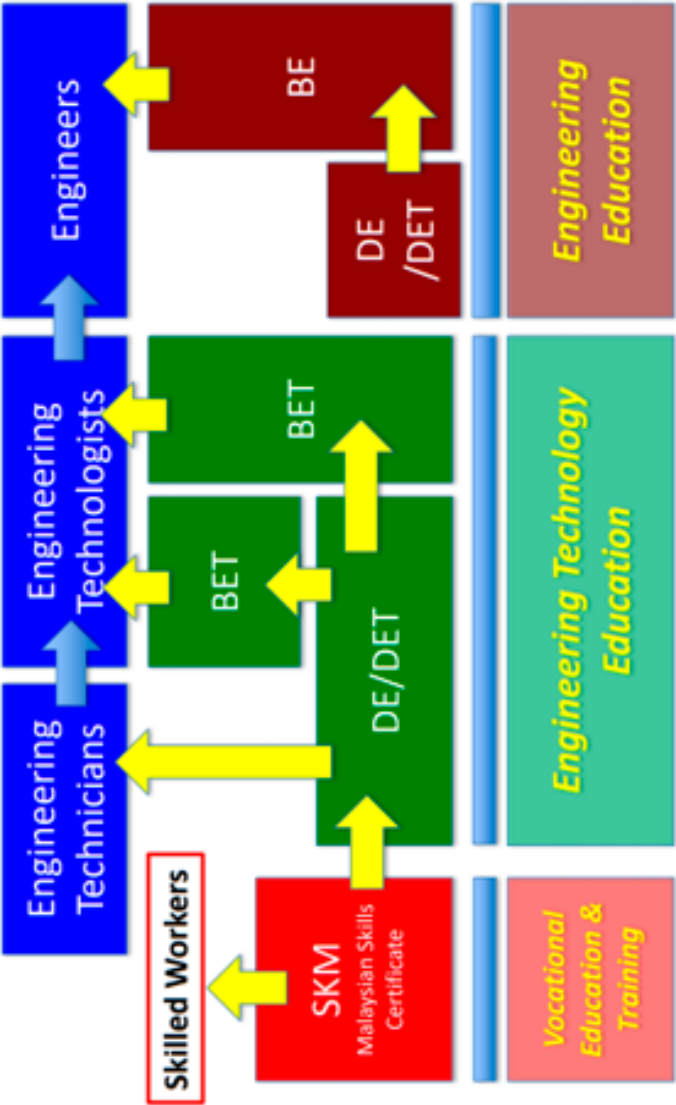
TVET-Engineering in Malaysia is comprehensive and divided into three categories. First, TVET Pre -Employment provides students with qualifications and skills before entering the world of work. Second, TVET in Employment offers education and training through reskilling and up-skilling programs. Third, Lifelong Learning provides skills training for target groups by developing talent and generating income. TVET- Engineering fields were categorised based on Malaysia Standard Industrial Classification 2008 (MSIC) in Malaysia. The Malaysia Standard Industrial Classification 2008 (MSIC) is a classification of all economic activities in Malaysia which adopts the International Standard Industrial Classification (ISIC) Revision 4. The primary purpose of the MSIC is to provide a standard framework for classifying establishments and other statistical units in the given industry in all official statistics. There are 17 TVET fields based on Malaysia Standard Industrial Classification 2008 (MSIC 2008), which are:

1. Agriculture, Forestry and Fishing
2. Mining and Quarrying
3. Manufacturing
4. Electricity, Gas, Steam and Air Conditioning Supply
5. Water Supply; Sewerage, Waste Management and Remediation Activities

6. Construction
7. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
8. Transportation and Storage
9. Accommodation and Food Service Activities
10. Information and Communication
11. Financial and Insurance/Takaful Activities
12. Real Estate Activities
13. Professional, Scientific and Technical Activities
14. Administrative and Support Service Activities
15. Public Administration and Defence; Compulsory Social Security
16. Human Health and Social Work Activities
17. Arts, Entertainment and Recreation

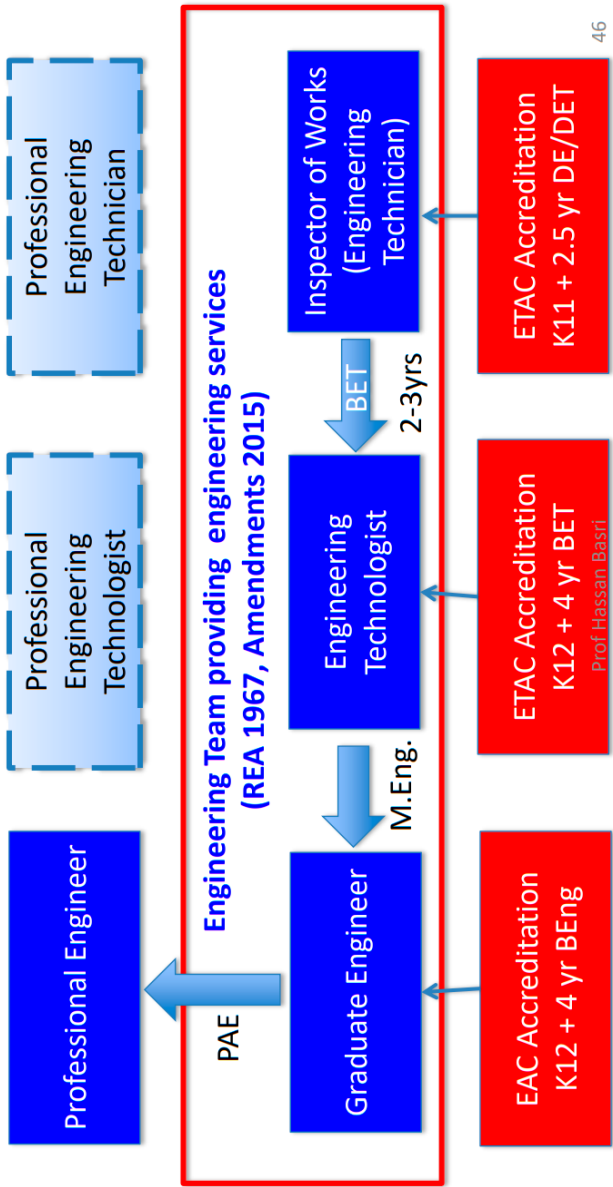
Thus, the TVET- Engineering was designed to produce graduates needed globally and educated to maintain a humane society based on the fields. In addition, TVET is also recognised under the *Wawasan Kemakmuran Bersama* (WKB) 2030 Malaysia as one of the enablers that can contribute towards the formation of a prosperous and inclusive developing country. Thus, Malaysian governments emphasise and recognise the critical role of TVET institutions for human development and employability patterns that focus on the relevance of skills to labour market needs. Malaysia currently serves more than 1.4 million students in higher education and training, of which 1.2 million are enrolled in higher learning institutions (HLIs) under the purview of the Ministry of Education (the Ministry). Specifically, the Ministry oversees 20 public universities, 33 polytechnics, 91 community

Figure 4 Engineering Team: Education Path.



DE: Diploma in Engineering. DET: Diploma in Engineering Technologist.
BE: Bachelor in Engineering. BET: Bachelor in Engineering Technologist.

Figure 5 Professional Pathways



colleges and 514 private HLI. Out of the 20 public universities, five have the status of Malaysian Research Universities (MRUs). The 33 polytechnics, in turn, consist of three Premier, five Metro and 25 Conventional institutions, while the 514 private HLI consist of 70 private universities, 34 private university colleges, and 410 private colleges. The system offers academic, technical, and vocational education and training (TVET) pathways to cater to diverse personal interests and industry needs.

Figure 3 summarises Malaysia's current education phases and pathways, from preschool to tertiary education. Based on Figure 3, Malaysian education starts from preschool until higher education. However, each level has an assessment to qualify students to the next level. In primary school, the Malaysian government has set the Primary School Achievement Test, also known as Ujian Pencapaian Sekolah Rendah (UPSR), before entering secondary school. Meanwhile, the secondary school in Malaysia was divided into lower secondary and upper secondary. Before graduating from secondary school, each level also has an evaluation: Pentaksiran Tingkatan 3 (PT3) or Form Three Assessment and Sijil Pelajaran Malaysia (SPM) or Malaysian Certificate of Education examination. Vocational education in Malaysia started after lower secondary evaluation (PT3). The student can enter the primary vocational education in Skills training institutes or Vocational Colleges to obtain Malaysian Vocational Certification, Malaysian Skills Certification, or Malaysian Advanced Diploma Certification.

Meanwhile, the students that graduate from upper secondary school has a choice to choose pure education field (Form 6 and Matriculation) or technical and vocational field (Polytechnics, Community Colleges, Vocational Colleges and Skills Training

Institutes) before continuing studies at a higher level as a graduate from university or graduate as a skilled and semi-skilled employer in a technical and vocational field. However, the graduate students from Form 6, Matriculation, Polytechnics, Community Colleges, Vocational Colleges, and Skills Training Institutes can further their studies at the university level to obtain either a Diploma or advanced diploma, bachelor of engineering, bachelor of engineering technology or higher learning institutions certificate.

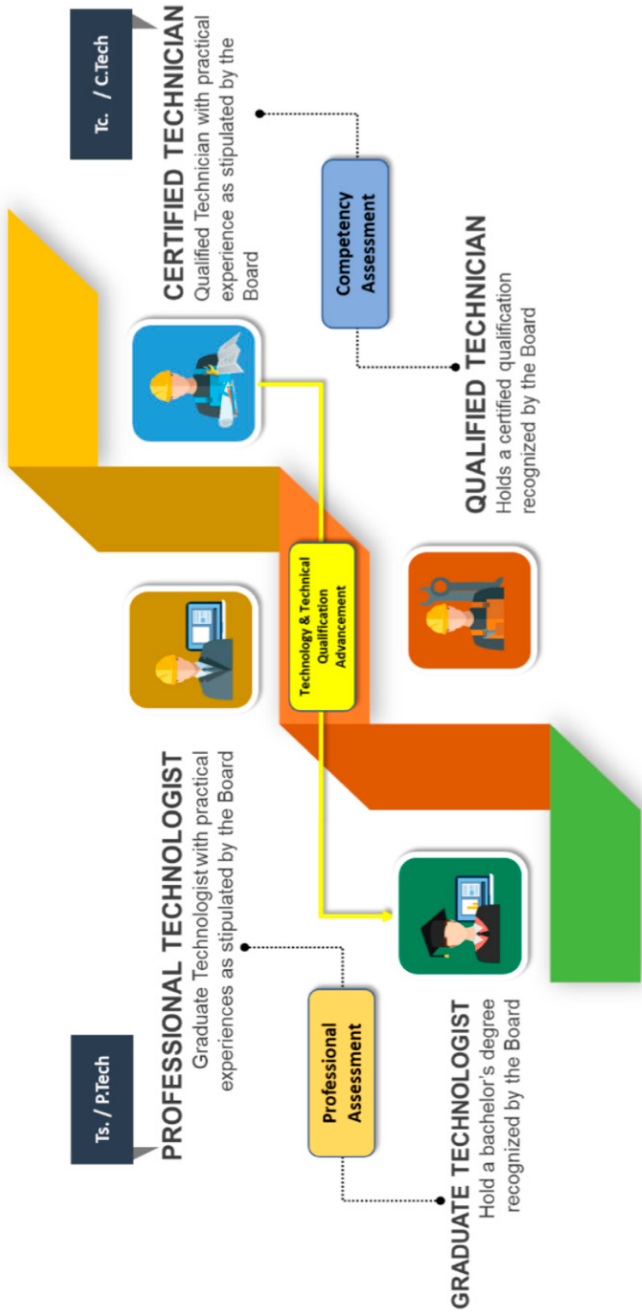
ENGINEERING TECHNOLOGY PROGRAM

In offering the application exposure to engineering information obtained in the lecture room, the composition of theoretical learning and practical training in engineering technology should be balanced equally or more inclined to learning in the workshop or laboratory. Because mastery of science and mathematics is still essential and considered an advantage to students, and skills obtained in workshops or laboratories become an added value in applying the engineering information learned, this approach is a high-level TVET programme study.

The Malaysian Board of Engineers and the Malaysian Board of Technology will regulate and initiate their respective accreditation under the Engineering Technology Accreditation Council (ETAC) and the Technology and Technical Accreditation Council (ETAC) to recognise the study programmes conducted in order to ensure the academic quality offered by this study programme.

Figure 4 and Figure 5 show the engineering team's education and professional pathways. Based on Figure 4, there are three

Figure 6 Continuous pathway for technologists and technicians in the technology program



different pathways to be an engineer in the Malaysian landscape: vocational education and training, engineering technology education, and engineering education. In the Malaysian TVET landscape, vocational education and training focused on producing an engineering graduate to become a skills worker based on the Malaysian Skill Certificate. However, this graduate can either enter the engineering technology education or graduate as engineering technician, engineering technologist, or engineer.

Figure 5 describes aspects of students' plans upon graduation as an engineering graduate. There are three ways of engineering graduate to be recognised as professional engineer or technician based on Board of Engineer Malaysia which are:

1. Engineering Accreditation Council Malaysia (EAC): K12 + 4 years experience as BEng (Bachelor in Engineering).
2. Engineering Accreditation Council Malaysia (EAC): K12 + 4 years experience as BET (Bachelor in Engineering Technologist).
3. Engineering Accreditation Council Malaysia (EAC): K11 + 2.5 years experience as BEng.

In Malaysia, graduate engineers (pure engineers) typically use scientists' scientific knowledge in planning, designing, and creating technical tools and systems. Meanwhile, graduate engineering technologists work closely with engineers to coordinate people, materials, and machinery to achieve specific project goals. In addition, engineering Technologists are often responsible for applying and improving technology. Thus, engineering and engineering technology will not bring a difference of standards, and it only differentiates the type of work.

TECHNOLOGY PROGRAM

The learning structure for B.Tech technology studies is more focused on practical training and skills relevant to the field of technology to be pioneered. B. Tech study programme provides the best opportunity for Malaysian Diploma in Skills graduates to continue their education at the bachelor's level. It is expected to pave the way for master's and doctoral studies in technology and skills, as is the case in developed countries such as Germany, which has a Meister programme—concentrating on the highest level of skill education for a specific branch of technology. It is envisaged that potential B. Tech technology students would be instilled with the ability to create to fulfil the needs of the labour market, industry, and technology that is becoming increasingly advanced as time passes. One of the characteristics that potential B. Tech graduates must have is the capacity to adapt to the needs of diverse sectors so that the skills taught remain relevant to current needs.

The industry's direct cooperation with technical educational institutions offering engineering technology courses and B.Tech is vital to bridge the gap between industry needs and energy resources, as the Minister of Human Resources advised during the last TVET Conference. The country requires skilled people. Indirectly, by increasing the number of talented graduates, we may reduce the dumping of foreign employees and even export skilled labour from the United States to countries in need. Furthermore, involving business in the development of engineering technologies and the B.Tech curriculum can help the country develop the competent people resources it will require in the future. Graduates with skills and technology will no longer be

considered second-class graduates but will instead be the key contributor to the country's economy.

In November 2016, the Malaysia Board of Technologists (MBOT) was officially formed as a professional body to award Professional Recognition to Technologists and Technicians. This took effect after the Parliament of Malaysia gazette the Technologists and Technicians Act 2015 (Act 768) in 2015. It is essential to recognise the roles and responsibilities of technologists and technicians in Malaysia as the nation gears towards the Fourth Industrial Revolution (TTAC, 2019). Therefore, the technologists and technicians who register with MBOT will have the opportunity to be recognised as graduate technologists, professional technologists or certified technicians in accordance with their expertise. Figure 6 illustrates the continuous pathway for technologists and technicians in the technology program.

Figure 6 shows that any bachelor's degree in the related technology and technical fields recognised by the MBOT will graduate as a professional technologist. Therefore, for the professional pathway, these graduate technologists who have registered and obtained practical experience determined by the MBOT with a minimum of 3 years of working experience in the related technology fields may apply to be professional technologists. Meanwhile, the qualified technicians in MBOT were referring to the graduate with a certificate qualification with minimum MQF Level 3 up to Advance Diploma MQF Level 5 based on Malaysian Qualification Framework (MQF) in the related technology and technical fields. Therefore, for the professional pathway, these qualified technicians with a minimum of 3 years of working experience in the related technology fields may apply to be certified technicians.

CONCLUSION

In Malaysia, TVET-Engineering is classified into two broad categories: engineering and engineering technology. Engineering and engineering technology has become a priority for most countries, including Malaysia, that require an efficient technical workforce. The distinction between engineering technology and engineering can be seen in the job focus; technologists are more concerned with application and implementation, whereas engineers are more concerned with research and development.

Additionally, the study of engineering technology encompasses additional technical knowledge and skills and is referred to as the Bachelor of Science in Engineering Technology (B. Tech) at the undergraduate level. In comparison, engineering (engineering science) is more concerned with theoretical and academic knowledge. Engineering technology work emphasises the practical application of engineering principles, whereas engineer work focuses on mathematical theory, scientific principles, and engineering principles.

However, both of these areas are critical for the country's development of standard engineering TVET compared to developed countries. As a result, the government has a compelling reason to advance engineering TVET as a major field of education in the country. Thus, engineering TVET in Malaysia has concentrated on the MSIC's 17 critical areas to boost national income. Apart from that, education in Malaysia is seen to have strengthened the field of TVET through the development of TVET institutions that enable students always to choose educational pathways based on their appropriate interests and achievements as measured by assessments at each main level,

namely primary, secondary schools, upper secondary schools, level 6, and matriculation. Besides,

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REFERENCES

1. Ab. Rahim, B. & Ivan Hanafi. 2007. Assessing Employability Skills of Technical-Vocational Students in Malaysia. *Journal of Social Sciences*. 3 (4), 202-207.
2. Ahmad, H. (2015). Leadership in TVET for the 21st Century: Challenges, Roles, and Characteristics. *Procedia—Social and Behavioral Sciences*. 195, 1471-1476.
3. Asian Development Bank, 2006. *Annual Report*. Manila, Philippines.
4. Audu, R., Kamin, Y. B. & Balash, F. (2013). Technical Vocational Education: As a Veritable Tool for Eradicating Youth Unemployment. *International Organization of Scientific Research Journal of Humanities and Social Science*. 8(2), 10-17.
5. Axmann, M. (2004). *Facilitating labor market entry for youth through enterprise-based schemes in vocational education and training and skills development* (No. 995037790002676). International Labour Organization.
6. Beute, N. & Matlala, M.E. 2007. Ways Of Increasing The Pool Of Technologists And Engineers, And The Role Of The Teacher In-Service Training Program (Tisp) In The Field Of Technology And Engineering : A South African Approach, Meeting the Growing Demand for Engineers and Their Educators 2010-2020. *International Summit 2007 IEEE*, pp 1-9.
7. Che Rus, R., Ruhizan M.Y., Faizal Amin N.Y., Mohd Bekri, R. & Irwan, M.I. 2015. Skilling for Job: A Grounded Theory of Vocational Training at Industrial Training Institutes of Malaysia. *Procedia—Social and Behavioral Sciences*. 204, 198-205.

8. Chua, J. H., & Jamil, H. (2012). Factors Influencing the Technological Pedagogical Content Knowledge (TPACK) among TVET instructors in Malaysian TVET Institution. *Procedia—Social and Behavioral Sciences*. 69, 1539–1547.
9. Department of Prime Minister. 2012. *The Malaysian Economy in Figure 2012*. Malaysia: Economic Planning Unit.
10. Department of Statistics Malaysia. 2018. *Department Of Statistics Malaysia Annual Report 2018*. Ministry of Economic Affairs: Putrajaya, Malaysia.
11. Economic Planning Unit, Department of Prime Minister. 1995. *Seventh Malaysia Plan 1996 to 2000*. Putrajaya.
12. *Economic Planning Unit, Department of Prime Minister. 2003. Eighth Malaysia Plan 2001 to 2005*. Putrajaya.
13. Economic Planning Unit, Department of Prime Minister. 2010. *Tenth Malaysia Plan 2011 to 2015*. Putrajaya.
14. Economic Planning Unit, Department of Prime Minister. 2015. *Eleventh Malaysia Plan 2016 to 2020*. Putrajaya.
15. Engineering Technology Programme Accreditation (ETAC), Board of Engineers Malaysia (BEM). 2019. *Engineering Technology Programme Accreditation Standard 2019 Manual Book*. Kuala Lumpur: Malaysia.
16. Haas, A. R. (1999). *Trends in articulation arrangements for technical and vocational education in the South East Asian region*. Melbourne, Australia: RMIT University. Retrieved from http://www.unevoc.unesco.org/fileadmin/user_upload/pubs/rmit99.pdf.
17. Institute of Labour Market Information and Analysis (ILMIA). 2018. *Laporan Akhir Kajian Pembangunan Pelan Induk Kebangsaan Latihan Teknikal dan Vokasional Ke Arah Negara Maju*. Kuala Lumpur.
18. International Labour Office (ILO). 2018. *The World Employment and Social Outlook: Trends 2018*. ILO Publications: Geneva, Switzerland.
19. Ismail, A. & Abidin, N.Z. 2014. Issues and Challenges of Technical and Vocational Education and Training in Malaysia Towards Human Capital Development. *Middle-East J. Sci. Res.*, 19 (*Innovation Challenges in Multidisciplinary Research & Practice*). 07-11, 2014. DOI: 10.5829/idosi.mejsr.2014.19.icmrp.2
20. Johanson, R. K., & Adams, A. V. 2004. *Skills development in sub-Saharan Africa*. The World Bank.
21. Lam, K.W & Hassan, A. 2018. Instructional Technology Competencies Perceived by Technical and Vocational Education and Training (TVET) Students in Malaysia. *International Journal of Academic Research in Business and Social Sciences*. 8(5), 343–366
22. Lim, H.E. & Mustafa, M.M., 2013. Effectiveness Of Industrial Training In Improving Students' Generic Skills. *International Journal of Business and Society*. 14(3), 368—375.
23. Majumdar, S., 2011. *Emerging Challenges and Trends in TVET in the Asia-Pacific Region*. Rotterdam/Boston/Taipei: Sense Publishers.

24. Malaysia Board Of Technologists (MBOT). 2017. *Draft Technology And Technical Programme Accreditation Manual 2017*. Putrajaya.
25. Mohd Amin, J. B. 2016. *Quality assurance of the qualification process in TVET: Malaysia Country*. In: TVET@Asia, issue 7, 1-12. Online: http://www.tvet-online.asia/issue7/mohd-amin_tvset7.pdf.
26. Muhammad Khair, N., Sarimah, I, Dayana Farzeeha, Ali., Ahmad Nabil M.N. & Mohd Safarin, N. 2016. Framework for Project-Based Learning (PjBL) in Providing Real-World Experience for Electrical Engineering Students. *The 1st International Virtual Conference on Multidisciplinary Method and Model*.
27. Nur, Y. F. A., Ruhizan, M. Y., & Bekri, R. M. (2015). Learning Transfer in National Occupational Skill Standard (NOSS) System and Workplace Learning: How Training Design Affect it?. *Procedia—Social and Behavioral Sciences*.174, 156–163.
28. Obwoye, M.E., 2016. The Dilemma of the TVET Teacher in Developing Countries in the 21st Century. *IRA-International Journal of Education & Multidisciplinary Studies*. 3(3). 342—346.
29. Ogwa, C.E., 2015. Enhancing the Use of Instructional Facilities in Technical Colleges for Qualitative Skills Acquisition in Nigeria. *Information and Knowledge Management*. 5 (10), 88-92.
30. Pemandu Padu TVET Lab Study. 2014. Malaysia Education Blueprint 2015—2025 (Higher Education). Putrajaya: Malaysia.
31. Pang, C.L., 2011. *Key Reforms in Revitalising Technical and Vocational Education and Training (TVET) in Malaysia. Regional Conference on Human Resource Development Through TVET as a Development Strategy in Asia*. Colombo Sri Lanka.
32. Paramasivama, S. & Muthusamy, K., 2012. Study of Critical Success Factors in Engineering Education Curriculum Development Using Six-Sigma Methodology. *Procedia—Social and Behavioral Sciences*. 56 (2012) 652—661.
33. Ramlee Mustapha & Ramziah Husin. 2002. Perancangan pendidikan untuk pembangunan sumber manusia dalam era globalisasi dan k-ekonomi. *Jurnal Teknologi*. 37(12),47-56.
34. Rockart, F., 1979. “Chief executives define their own data needs,” *Harvard Business Review Issue*. 57, 81-93.
35. Sulaiman, N.L., Mohd Salleh, K., Mohamad, M.M. & Lai, C.S. 2015. Technical and Vocational Education in Malaysia: Policy, Leadership, and Professional Growth on Malaysia Women. *Asian Social Science*. 11 (24), 153-161.
36. Technology and Technical Accreditation Council (TTAC). 2019. *Technology And Technical Programme Accreditation Manual 2019*. Malaysia Board Of Technologists (MBOT): Putrajaya.
37. Umar, I. Y. & Ma’aji, A. S. 2010. Repositioning the Facilities in Technical College Workshops for Efficiency: A Case Study of North Central Nigeria. *Journal of sTEm Teacher Education*. 47(3), 1-9.

38. UNESCO. 2016. *Recommendation Concerning Technical and Vocational Education and Training (TVET) 2015*. Paris, France: UNESCO.
39. UNESCO. 2014. *2014 Education For All (EFA) report: Teaching and Learning for Development*. United Nations Educational, Scientific, and Cultural Organization. Publication: France.
40. European Union. 2017. *Vocational education and training for inclusive growth in development cooperation*. Publications Office of the European Union, 2017.
41. World Bank. 2011. *The World Bank Annual Report 2011: Year in Review*. The World Bank: Washington, DC. Retrieved From <https://openknowledge.worldbank.org/handle/10986/2378> License: CC BY 3.0 IGO.”
42. Yaakob, H., 2017. Technical and Vocational Education & Training (TVET) Institutions Towards Statutory Body: Case Study of Malaysian Polytechnic. *Advanced Journal of Technical and Vocational Education*. 1 (2), 07-13.
43. Zaharim A, Md Yusoff Y, Omar M.Z., Mohamed A., Muhamad N., Mustapha R. 2009. Engineering Employability Skills Required By Employers In Asia. *6th WSEAS International Conference on Engineering Education* (E.E. '09). 2009, 195-201.
44. Zain, Z. M. (2011). TVET in Malaysia. Retrieved from: <http://dspace.unimap.edu.my/dspace/bitstream/123456789/7186/1/TVET%20in%20Malaysia.pdf>

Simulation Pedagogy in Action —Challenges and Possibilities

Marianne Teräs & Jorma Jokela

ABSTRACT:

This chapter explores the intersection of pedagogy and health care simulations, reflecting the evolving landscape of simulation technologies in education. Simulations, crucial in health care for both students and professionals, aim to replicate authentic work scenarios, fostering skills, competencies, and interprofessional collaboration. The text outlines various types of simulation, including computer-based, live, simulator-based, and those employing virtual and augmented reality. It delves into the concept of simulation pedagogy and examines different pedagogical models. Additionally, it discusses the use of Kolb's experiential learning theory, acknowledging both its significance and criticism. Ethical considerations and pedagogical dilemmas surrounding simulation authenticity, fidelity, and participant engagement are explored, with a focus on the delicate balance between deception and realistic professional practice. The chapter concludes by presenting three examples of simulation scenarios in health care education, showcasing their diverse applications and the challenges associated with transitioning to virtual simulations, especially in the context of the COVID-19 pandemic. Overall, the chapter advocates a thoughtful integra-

tion of pedagogical principles and ethical considerations in the design and implementation of health care simulations.

KEYWORDS

Simulations, health care, pedagogical models, pedagogical dilemmas

INTRODUCTION

Various types of simulations are increasingly used to study expertise in health care. In health care, one often needs to work in busy and critical situations, which requires skills and competencies as well as efficient and safe cooperation between different professional groups. Simulations are learning situations that mimic authentic work situations that students may encounter in working life. They are used for learning the skills and competencies students will need in professional life, but also for continuous learning for professionals and for the development of practices. Simulations have been proved to be good opportunities for students to practise within their scope of practice, think critically, solve problems, use clinical reasoning, engage in multi-professional cooperation and care for diverse patients in a non-threatening, safe environment (Jeffries, 2005). We perceive simulations as an umbrella for various kinds of learning situation in which learning is mediated via different materials and technological tools.

There are usually three different types of simulation: computer-based simulations such as learning decision-making in health care; 'live' simulations such as encountering so-called 'standard

patients' or actors simulating a situation; and simulator-based or mannequins as used when learning to encounter patients with pain (e.g., Banks & Sokolowski, 2011). The simulator is a computer programmed to react to different doses of painkillers that students can use. In recent years, a fourth type of simulation has become popular employing virtual reality (VR) and augmented reality to enhance the authenticity of the learning situation (Scavarelli et al., 2021).

The development of teaching technology is rapid. Benotmane et al. (2019) name some of the newest elements such as artificial intelligence and robotics besides simulations. They also see simulations as a learning and evaluation method that uses pedagogical solutions, and refer to simulations as an interactive process of social, technological and other material-symbolic tools, where the participants practise the skills needed in their work (see also Teräs et al., 2013).

Pedagogy is a fuzzy concept. It can be approached from a narrow perspective representing a pedagogical approach like Montessori pedagogy or from a broad perspective such as early childhood pedagogy. We can also approach pedagogy as an abstract general concept or as a practical one referring to teaching, learning and assessment practices as didactical practices. In general, pedagogy means 'the art and science of teaching and learning' and how we think, talk and act about it (cf. Beetham & Sharpe, 2020). In the same line, we can say that simulation pedagogy means how we teach and organise the simulations in a way that enables the learning of new knowledge and practices. Furthermore, Beetham and Sharpe (2020) state that we need to rethink pedagogy in the digital age, reflecting on how different digital tools and platforms are used in teaching and learning practices.

They perceive 'design for learning' or 'learning design' as a holistic process of organising teaching and learning with technology. They refer to Lewin et al. (2018, p. 2) who see it as 'a formal process for planning technology-enhanced learning activities, usually supported within a community where designs and ideas can be shared and re-used'.

The aim of this chapter is to examine health care simulations from the point of view of pedagogy in simulations. They have already been used for decades in health care, but very often the focus has been on the development of technology, partly because the technology has opened up new possibilities for simulations; however, in recent years more attention has been given to learning and pedagogy used in simulations. In a scoping review, Poikela and Teräs (2015) identified learning theories and pedagogical models used in simulations and concluded that learning was conceptualised in different ways, such as simulation-based learning, simulation as a teaching and learning strategy or simulated learning. Furthermore, various learning theories were used, mostly, experiential learning by Kolb and problem-based learning to understand the complexities of learning in simulations.

Interestingly, Erlam et al. (2017) state that simulation is not a pedagogy and declare that it is an immersive teaching/learning platform. We also see that it is a rather complex tool and method for learning skills and competencies. There seem to be some who advocate simulations as an overall tool for learning and who believe that everything can be taught via simulations. However, we take a more critical stance and argue that using simulations needs to be pedagogically grounded. Teachers need to take into account the subject of learning that is what is the content of learning. The object of learning refers to why this content needs

to be learned and by whom meaning who are the learners and lastly how the simulation needs to be implemented. These are called the didactical questions of teaching.

PEDAGOGY IN SIMULATIONS—THEORETICAL UNDERPINNINGS

Erlam et al. (2017) name three instructional design principles based on educational theories: behaviourist such as rote learning and repetition, cognitivist such as observational techniques and bootstrapping, and the constructivist principle such as new habit formation through experience. We would like to add a fourth one: the socio-material principle such as learning in multi-professional teams. Different instructional design principles are seen in various pedagogical models used in simulations. We perceive pedagogy in simulations as a cross-section of three different aspects that are intertwined: a tool and a method as well as pedagogical and didactical principles used in simulations.

One frequently used pedagogical model is a process model by Dieckmann (2009). In this model, the simulation is divided into seven modules: setting intro, simulator briefing, theory, scenario briefing, scenario, debriefing and ending. In the briefing phase, the participants of the simulation are given information about the scenario. Typically, the participants are given the same amount of information as in real-life situations, which encourages them to seek more information by asking questions. After the briefing, the participants act in a scenario, which can vary from meeting a patient experiencing fear before surgery to encountering a patient with breathing difficulties. A scenario can last from a short encounter to a longer more complex situ-

ation, depending on the content and the aim of learning. In a debriefing phase, the participants can reflect on their learning with the group. In some cases, other people may follow the scenario via videos.

The model was later developed further by Keskitalo (2015, p. 66). In the model, she separated the measures taken by the teacher and the student in different phases of the simulation exercise. In addition, she combined the process model with Ausubel's meaningful learning theory and socio-cultural approach. Her model consisted of elements such as pre-actions, introduction activating prior knowledge, setting the ground, simulator and scenario briefing familiarisation, scenarios guiding and participation, debriefing facilitating and reflection and post-actions. This model has a total of 14 cornerstones, so it is obviously complex and needs to be carefully planned when used in simulation teaching.

Poikela (2017) invented a model based on trialogical learning by Hakkarainen. Her model takes into account the participants, the object of learning, the tools used in simulations, and the collaborative knowledge creation. The model shows a learning process that ranges from quiet to explicit, depending on the stage the learners have reached in their learning process. This means that the learning process is an open system. Quiet and explicit learning covers socialisation, outsourcing, combining, and internalising. Knowledge flows in from various sources, such as social media, newspapers, scientific articles etc. The environment makes learning progress towards knowledge creation (Poikela, 2017).

Poikela and Teräs (2015) found out that different learning theories were used in simulations, but most frequently Kolb's

experiential learning (ELT). This can reflect that simulations are complex learning situations that need to be approached from different angles and that various learning theories highlight different aspects of learning. Kolb's graphical model forms a cycle from a concrete experience through reflection on experience and conceptualisation of learning to experimentation (Kolb, 1984). Simulation technologies are playing an ever-increasing role within simulation centres or in classrooms (Poore et al., 2014). ELT as a comprehensive theory of learning seeks to provide a foundation for effective instruction/design that goes beyond learning outcomes and seeks to focus students on discovering what specific processes enhance their learning abilities individually (Kolb & Kolb, 2005). Within ELT, the notion that the process of learning is a skill and not merely contained in a specific subject domain is at its foundational core.

Kolb's theory has also received criticism. Bergsteiner, Avery and Neumann (2010) state that Kolb's basic model reveals fundamental graphic syntax errors, fails to meet modellers' graphic sufficiency, and has categorisation and definitional problems relating to learning activities and typologies, among other things. Researchers propose guidelines for recasting the model with a view to overcoming weaknesses, guiding future research and theory development, and starting to integrate the disparate field of experiential learning (Bergsteiner et al., 2010).

According to Howard and Marshall (2019), ELT contends that learning is gained through experience. ELT is still widely discussed to this day. Given the recent rise of simulation training and VR that offer participants a life-like and in some cases, immersive experience, ELT could be argued to have gained a higher degree of relevance in simulation training. The possibility

that one may be able to learn from simulations and VR experiences could lead to a shift in the current educational paradigm of teaching/learning.

PEDAGOGICAL DILEMMAS AND ETHICAL QUESTIONS RELATED TO SIMULATIONS

There are some pedagogical problems and dilemmas that we have identified in relation to simulation training that a teacher using simulations needs to consider. Yaffe and Maskit (2010, p. 94) see pedagogical dilemmas as “problems that do not have one definite solution: one might describe them as problems that provoke more discussion and have several solutions.” They continue that “Every dilemma had at least two horns and there was often a tension between those two horns.” (p. 98). Many of the pedagogical dilemmas in simulations are connected to ‘how real’ they are. In other words, their closeness to authentic work practices and situations. Simulation educators identify that simulations are somewhere ‘between the real and unreal’ (Calhoun et al., 2015), which could cause pedagogical dilemmas concerned with authenticity v. simulated situation, fidelity v. manipulation, deception v. the actual practice, and suspension of disbelief v. willingness to engage,

The authenticity of a simulation scenario has been discussed frequently since the method was first used. On the one hand, the closeness to actual work practices is a great benefit of simulation training, as Rooney and Nyström (2018, p. 55) write, “the more real the better”. On the other hand, the aim of a simulation scenario is to learn something needed in work practices, and as Rystedt and Sjöblom (2012) state, simulation is a practice in

its own right. Another question is, what does a teacher want to transfer from working life to simulations? As Langemeyr (2012) pointed out, not only the good practices were transferred but the students in her study showed stereotypical and hierarchical attitudes during the scenario. She wrote: “Since work process knowledge cannot be appropriated without acting within certain roles, the method of simulation-based learning must be improved by critical reflections on stereotypes of authorities, leadership and gender roles—especially when they are rather instinctively, not consciously reproduced.” (Langemeyer, 2012, p. 20)

Another, heatedly discussed dilemma is related to the fidelity in a simulation scenario. Fidelity is thought to be increased by increased use of technology, but this is a narrow perspective. Fidelity is important. In other words, how loyal or accurate the scenario is or needs to be in relation to authentic work practice and how much a scenario can be manipulated in order to enhance students’ learning. Aarkrog (2018, p. 1) wrote: “The degree of fidelity should be adjusted to the students’ practical experiences in order to optimise their learning process. Lower degrees of fidelity may have a positive impact on developing creative thinking and reducing the students’ anxiety.” Her statement takes the learning process as a starting point when planning simulation training. This is of particular importance in emotionally difficult simulations. Konkola (2018) stated that having enough information in the briefing phase is especially important to reduce students’ anxiety.

A third dilemma, also heavily debated over the years, is the willingness to participate in simulation and ‘suspension of disbelief’ (see Herrington et al., 2003) v. reluctance and doubt about participation. The participants need to believe that the scenario

is ‘real’ and they need to willingly participate in it, for example, to take different professional roles in the simulation. This has also to do with the sense of control v. freedom, i.e. how much freedom the participants feel they have to act in the scenario instead of the feeling of control when the other participants are following the performance.

In connection with dilemmas, there are some ethical questions in relation to simulation training. Calhoun et al. (2015, p. 163) discuss the concept of ‘deception’. They state that simulations are “...modulations where there is no clear agreement or knowledge among participants regarding the ground rules of the activity. In simulation, the concern is about the lack of agreement or consent.” Educators need to carefully consider if deception is necessary and find a balance between deception and realistic learning experience. Teachers using simulations need to consider this and carefully plan their simulation to follow ethical rules to increase patient safety, minimise errors and promote learning. For example, simulation training may have an impact on the self-image of the participants, especially, if the participant is acting in a way that is not correct or if the participant makes mistakes. The teacher needs to ensure that the simulation is a safe space for learning for the participants.

EXAMPLES OF SIMULATIONS

Next, we will give three different examples that have been used in simulation training in health care education for nurse students in Laurea University of Applied Sciences in Finland. The first example shows how a simulation was implemented virtually during the COVID-19 pandemic. At extremely short notice, the corona-

virus crisis has given rise to a whole new need to be able to learn in an agile manner and teach skills online and long-term without compromising the quality of the progress of studies or the teaching of nursing students. There are no good, comprehensive solutions to this. Distance education, or at least hybrid education, i.e. combined distance and face-to-face education, is expected to continue in higher education institutions for a long time. In late spring 2020, Laurea University of Applied Sciences began a course of study in supplementary studies in nursing education, at the end of which a simulation exercise combining the issues taught in the course was carried out. The teachers involved in the course decided to carry out the simulation exercise virtually. The virtual simulation was implemented using the Zoom web tool. Moving the simulation exercise to Zoom required teachers to have an accurate and comprehensive script of the course, stages, and roles of the entire simulation process. (Jokela et al., 2020.)

The second example focused on knowledge about different wounds and their care process. In addition, the purpose of the simulation was to consider the sustainable development/carbon footprint of wound care.

EXAMPLE I

Description of the scenario: A patient called Taru Lehtinen arrived at the update clinic yesterday suffering from fever and shortness of breath. She developed a fever about a week ago. At the doctor's office five days ago, she was told to rest and take antipyretics because of a viral infection. Now it was getting worse. In the emergency department, her blood levels of inflammation were high and the lung scans showed clear find-

ings suggestive of pneumonia. Blood cultures were taken two times. Antimicrobial treatment was started intravenously three times a day. She received the first dose at 00:30 and the second at 8.00. At 8.00 a.m., her blood oxygen levels were almost normal, the temperature was 38.6, blood pressure was 130/76, vascular heart rate was 90 regular. The breathing rate was not measured. The room-mate rang the bell because she noticed that the patient was confused. The subject of the simulation exercise was the identification of sepsis and/or septic shock developing in the patient.

The objectives of the exercise were to identify the symptoms of septic shock, to know the key initial care, to call the doctor in accordance with the Identify, Situation, Background, Assessment and Recommendation (ISBAR). ISBAR involves, for example, how situation of the patient has changed showing situational awareness and how teamwork is implemented. In the first phase, at the beginning of the exercise, the key issues of sepsis and septic shock were discussed together. This refers to the development of sepsis and septic shock and reactions in the body, changes in the patient's condition and assessment of the patient's condition using the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) method. Assessment of the need for the treatment and initiation of treatment were focused on in the exercise. In addition, the ISBAR reporting guidelines were reviewed. This exercise preparation section was implemented as a PowerPoint presentation and discussion. Thereafter three volunteer students were requested for the simulation scenario exercise, two for the role of nurse and one for the role of nurse student. Thus, during the exercise, students had to think about situational management and the distribution of tasks. Other

students who were observing the exercise were given their own topics to observe in pairs, namely: situational awareness, the consistency of action, medical care, ABCDE, ISBAR, thinking aloud, teamwork, and patient guidance. While sharing the roles of observers, the three students acting in the simulation exercise were briefly moved to a separate virtual room with Zoom's Breakout Room function to plan their activities as a group. An instructional discussion with the participants was conducted as a debriefing of the simulation. From the point of view of pedagogical models, this simulation used modified Dieckmann elements: theoretical bases of the scenario, briefing of the scenario, scenario exercise, observation, debriefing and ending.

Students were asked for feedback via chat at the end of the online simulation exercise. Student feedback on online simulation was mostly positive, which reflected students' willingness to participate in the simulation. According to them, the simulation worked well remotely. As a development topic, students mentioned how to make the patient's monitor and measurements more visible. Students found online simulation much more challenging than the traditional way of simulating because there was no actual patient. This can be understood as decreasing the authenticity and fidelity of the simulation. In addition, they thought that there was no group pressure to do simulation exercises, which may decrease anxiety in the simulation. Everyone was taken into account in the debriefing phase and everyone was allowed to give their own opinions about what had happened. In addition, those who experienced the online simulation as comfortable experienced it as a variation in relation to regular distance training, and they thought that the implementation was successful. (Jokela et al., 2020.)

EXAMPLE II

The simulation of wound care simulates different areas of care, such as aseptic activity, interaction between the patient and nurse, and attention to sustainable development in wound care. These three areas have been considered cross-cutting areas in various wound care simulations, simulation exercises for leg wound cleaning and wound dressing replacement. The aim of the simulation was to clean the patient's leg ulcer and place the wound dressings on top of it. The purpose of the simulation was to consider the sustainable development/carbon footprint of wound care.

The specialist-specialisation training in wound care was designed as a further education for healthcare professionals such as nurses, midwives, paramedics and podiatrists. The education was aimed at those already working to promote their continuous professional development. The training was divided into two main sections: clinical competence in evidence-based wound care (including various wounds and their treatment principles, wound healing, its evaluation and documentation, the wound patient's quality of life and self-care support, 20 credits) and guidance on development of evidence-based wound care expertise (including wound care quality management and effectiveness and wound care development in the work community, 10 credits). In this simulation, some participants acted as a patients with masked wounds. The wound care was performed by other participants in pairs. The scenario was a so-called low-level simulation and was not video-recorded. The observer-participants were given their own evidence-based wound care areas to observe, but each was given the task of observing, among

other things, from the perspective of sustainable development, the provision and use of wound products and treatment equipment in the context of wound care. The training combined distance and contact teaching.

This simulation used the model by Keskitalo (2015). The model distinguishes measures taken by the teacher and the student at different stages of the simulation exercise. In the first phase, the teacher focuses on the selection of resources and an appropriate training scenario suitable for the target group, while the students become familiar with the content to be studied. In the introductory stage, the teacher introduces the topic of the course and the key concepts, informs about the course organisation and introduces the learning objectives, and the students activate their pre-knowledge and experiences related to the simulation exercise. In the simulation and scenario orientation phase, the teacher introduces the scenario and the objectives, roles, rules, required actions and necessary decisions in general, while the students are supposed to familiarise themselves with the simulation environment and the simulated case, their practice roles and set their individual goals. During the scenario, the students practice in the scenario, applying their knowledge and skills, while the teacher directs and observes the students' activities. In the debriefing or feedback phase, students evaluate and reflect on the learning process and the information and learning environment applied in it in a holistic way, setting new learning goals based on it. The teacher guides the reflection of the students, providing individual guidance and feedback. As an after-action, the students integrate new knowledge and skills in a real-life operating environment or in a new simulation scenario and the teacher evaluates the learning process. (Kalalahti, 2016.)

EXAMPLE III

This simulation continues the wound care simulation so that the purpose was that the participants learn to teach colleagues at workplaces about evidence-based wound care. In addition, the participants were using simulation pedagogical principles in doing so. The simulation combined an expert lecture and wound care simulation. In this way, students were more motivated and committed to participating in the expert lecture. The simulation was prepared either by the teacher or small groups of students. The students designed the simulation and they needed to consider simulations from the perspective of simulation pedagogy. For example, the aim of teaching, the content of simulation, the target group and the level of simulation needed to be taken into account.

When thinking about experiential learning, Kolb's (Kolb & Kolb, 2009, p. 299) cycle of experiential learning is often used, based on four stages: concrete experience, reflective examination, abstract conceptualisation, and active experimentation. The model describes well the alternation between the experience and its structuring (reflection). The model has also been used to emphasise the importance of theoretical knowledge in structuring experiential learning. In this simulation, the participants had several, concrete experiences of wound care, but they needed evidence-based theoretical knowledge about it and the expert lecture provided it. Simulation was an active experiment putting theoretical knowledge into action, and reflecting on it at the end, in the debriefing stage.

CONCLUDING REMARKS

This chapter has focused on health care simulations from the point of view of the pedagogy used in simulations. Simulations have been used for years to mimic work situations and to teach health care students the skills and competencies they need in working life. The rapid development of technology has both its pros and cons. In addition, technological development increases the complexity of simulations. On the one hand, it may increase the authenticity and fidelity of simulations, but on the other hand, pedagogy can lag behind technological development.

However, educators have taken up this challenge and developed different pedagogical models and principles for simulations. We have presented some of them in this chapter. We see that simulations can be powerful tools for learning professional practices for nursing students, and they can be tools for continuous learning for professionals. However, simulations need to be embedded in pedagogical principles, and when planning simulations educators need to consider both pedagogical dilemmas and ethical questions that the simulations may provoke. The simulation level may alter depending on the objective of learning, the content and subject matter of learning and the target group. Different pedagogical models and principles may be used accordingly. Simulations offer rich material for innovations, research and development.

REFERENCES

- Aarkrog, V. (2019). The mannequin is more lifelike: The significance of fidelity for students' learning in simulation-based training in the social- and health-care programmes. *Nordic Journal of Vocational Education and Training*, 9(2), 1–18. <https://njvet.ep.liu.se/article/view/885>

- Banks, C., & Sokolowski, J. (2011). Fundamentals of medical and health sciences modeling and simulation. In J. Sokolowski & C. Banks (Eds.), *Modeling and simulation in health sciences* (pp. 4-32). John Wiley & Sons.
- Beetham, H., & Sharpe, R. (2020). An introduction to rethinking pedagogy. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Principles and practices of design* (pp. 1-14). Third edition. Routledge.
- Benotsmane, R., Kovács, G., & Dudás, L. (2019). Economic, social impacts and operation of smart factories in industry 4.0: Focusing on simulation and artificial intelligence of collaborating robots. *Social Sciences*, 8(5), 143.
- Bergsteiner, HG., Avery, G., & Neumann, R. (2010). Kolb's experiential learning model: Critique from a modelling perspective. *Studies in Continuing Education*, 32(1), 29-46.
- Calhoun, AW, Pian-Smith, MCM., Truog, RD., Gaba, DM., & Meyer, EC. (2015). Deception and simulation education issues, concepts, and commentary. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, 10(3), 163-169. <https://doi.org/10.1097/SIH.000000000000086>
- Dieckmann P. (2009). Simulation settings for learning in acute medical care. In Dieckmann P. (Ed.), *Using simulations for education, training and research* (pp. 40-138). Pabst.
- Erlam, G.D., Smythe, L., & Clair, W.S. (2017). Simulation is not a pedagogy. *Open Journal of Nursing*, 7(7), 779-787.
- Herrington, J., Oliver, T., & Reeves, TC. (2003). Patterns of engagement in authentic online learning environments. *Australian Journal of Educational Technology*, 19(1), 59-71. <https://doi.org/10.14742/ajet.1701>
- Howard, M.C., & Marshall, C.J. (2019). Virtual reality training in organizations. In R.N. Landers, (Ed.), *The Cambridge handbook of technology and employee behavior* (pp. 347-383). Cambridge University Press.
- Jeffries, P. R. (2005). A framework for designing, implementing, and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives*, 26(2), 96-103.
- Jokela, J., Makkonen, A., & Mikkola, S. (2020) Realistisen simulaation ja verkkosimulaation yhtäläisyydet ja erot loppuvaiheen hoitotyön opetuksessa [Similarities and differences between realistic simulation and web-based simulation in the final stage of nursing education]. In T-K. Aholaakko & T. Mäkelä, (Eds.), *Oppimista, opettamista ja tutkivaa kehittämistä—sairaanhoitajan työn kaksi vuosisataa*. Laurea publications 153. Laurea University of Applied Sciences.
- Kalalahti, J. (2016). *Simulaatioiden opetuskäyttö SM:n hallinnonalan koulutusorganisaatioiden perustutkintokoulutuksessa* [Educational use of simulations in undergraduate education in the educational organisations of the Ministry of Interior]. Police University College
- Keskitalo, T. (2015). *Developing a pedagogical model for simulation-based health-care education* [Doctoral dissertation, University of Lapland]. Lauda. <http://urn.f/URN:ISBN:978-952-484-812-1>

- Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Pearson.
- Kolb, A., & Kolb, D. (2005). *The Kolb learning style inventory—Version 3.1 2005 Technical Specifications*. Experience Based Learning Systems.
- Kolb, A., & Kolb, D. (2009). Experiential learning theory: A dynamic holistic approach to management learning, education and development. In S.J. Armstrong & C. Fukami, (Eds.), *Handbook of management learning, education and development* (pp. 42–68). Sage.
- Konkola, S. 2018. *Terveystieteiden korkeakouluopiskelijoiden emootiot simulaatioissa* [Emotions in simulations of health care students in higher education]. Master's Thesis. University of Helsinki, Faculty of Education.
- Langemeyer, I. (2014). Learning in a simulation-OT in heart surgery and the challenges of the scientification of work. *Journal of Work and Education*, 27(3), 284–305. <http://dx.doi.org/10.1080/13639080.2012.742182>
- Poikela, P. (2017). *Rethinking computer-based simulation: Concepts and models* (Doctoral dissertation). Acta Electronica Universitatis Lapponiensis 344. Lapland University Press.
- Poikela, P., & Teräs, M. (2015). A Scoping review: Conceptualizations and pedagogical models of learning in nursing simulations. *Educational Research and Reviews*, 10(8), 1023–1033. <https://doi.org/10.5897/ERR2015.2156>
- Poore, JA., Cullen, DL., & Schaar, GL. (2014). Simulation-based interprofessional education guided by Kolb's experiential learning theory. *Clinical Simulation in Nursing*, 10(5), e241–e247. <https://doi.org/10.1016/j.ecns.2014.01.004>
- Rooney, D., & Nyström, S. (2018). Simulation: A complex pedagogical space. *Australasian Journal of Educational Technology*, 34(6). <https://doi.org/10.14742/ajet.4470>
- Rystedt, H., & Sjöblom, B. (2012). Realism, authenticity, and learning in health-care simulations: Rules of relevance and irrelevance as interactive achievements. *Instructional Science*, 40(5), 785–798. <http://www.jstor.org/stable/43575426>
- Scavarelli, A., Arya, A., & Teather, R.J. (2021). Virtual reality and augmented reality in social learning spaces: A literature review. *Virtual Reality*, 25(1), 257–277. <https://doi.org/10.1007/s10055-020-00444-8>
- Teräs, M., Poikela, P., & Lahtela, M. (2013). Avattaren avulla ammattilaiseksi? Simulaatiovälitteinen oppiminen terveysalalla [Developing into a professional via avatar? Simulation-mediated learning in health care]. *Ammattikasvatuksen aikakauskirja*, 15(3), 66–80. <https://journal.fi/akakk/article/view/113941>
- Yaffe, E., & Maskit, D. (2010) Discussing pedagogical dilemmas with teacher educators: Facilitating their professional development. *Professional Development in Education*, 36(1-2), 93–109. <https://doi.org/10.1080/19415250903454890>

