



The Impact of a M.Sc. Program on the Career Paths of Postgraduate Students

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Abstract

The research study can provide important information for curriculum quality. A paradigm of curriculum evaluation describes the quality of an educational program as transformative. The present study concerns a three-semester Inter-Institutional Master of Science program in Chemistry Education, Information and Communication Technology and Education for Sustainable Development that is organized by the Department of Chemistry at the National and Kapodistrian University of Athens. The program aims at the professional development of postgraduate students and educates them in: (a) chemistry education research, (b) development new methods of teaching and assessment in chemistry, (c) connections between chemistry and chemical technology in everyday life, (d) development of education material using information and communication technologies, and (e) adoption of sustainable development goals in the teaching of chemistry. The present study describes an alumni online survey that assesses postgraduates' perceptions about the impact of the program on their career paths based on the transformative paradigm. Seventy (70) postgraduates from 2001 to 2022 responded. Although the low response rate of alumni which was mainly due to bad contact information, it has been suggested that the differences of the response rates do not affect the representativeness of the results. Overall, the program received positive feedback.

Keywords: Curriculum Evaluation, Professional Development, transformative quality

1 Introduction

The relationship between higher education and the labor market has been the focus of educational reforms in many countries, especially after the economic crisis [1-3]. In this context, attention has been paid to the role of universities to educate students suited for different professional positions. It is frequently a subject for evaluation to what extent the graduates achieve the desirable skills. To answer this question, a quality evaluation focusing on learning outcomes has become increasingly important in the field of accreditation of institutes of higher education by several stakeholders as students, employers of graduates, and alumni. The last group, the alumni, is often overlooked when it comes to assessing learning outcomes [4].

Alumni research is a relatively new area of educational research. In the USA a large increase of this type of research began in the end of twenty century [4, 5]. Compared to the USA, Europe is falling behind even further when it comes to alumni research. Thus, the scientific community has a lot to learn in terms of curriculum development and the evaluation of learning outcomes by alumni research [4]. Particularly, the master's degree education is an interesting case, as it has been expanded globally during the 20th century, and it has been related with social and economic changes [6]. Despite of this expansion, few studies have been conducted to examine the relation between master's degree graduates and their labour market outcomes [4, 7, 8].

To address some of the gaps of previous research, we use the master program "Chemistry Education, Information and Communication Technology and Education for Sustainable Development" (ChEd-ICT-ESD) as a case study to investigate whether holding a master's degree has significant impact on labour market outcomes in terms of the career paths. It is expected that this study, even though mainly centered on a postgraduate program for chemistry teachers in secondary education, may contribute to the development of knowledge for a deepened understanding about the impact of the masters' programs on allumni career paths. Furthermore, this study aims to better understand the role of masters' programs, which could be helpful for the development of policies and educative strategies to improve science education not only in Greece but in a wider international perspective.

Therefore, the following research questions-guided this study: (1) does a Master program affect the labour market outcomes in terms of postgraduates (alumni) career paths? (2) Does gender and career changes of postgraduates (alumni) affect their perceptions about the impact of master program on their professional development and their professional practices?



2. Theoretical framework

The quality of an educational program is often described as transformative [9]. However, the notions of quality and transformation and their interrelationships are not clearly defined. Quality is perceived as external, and separate from everyday work [10], which relates to the bureaucracy [11], by the academic community. From the students' viewpoint quality is understood as passing examinations [12] or something valuable and meaningful [10]. An explanation for this polysemy is the complexity of higher education as its different components, such as teaching and research, have different requirements for quality [13]. On the other hand, while transformation is usually associated with change and the process of reform, it has both positive and negative aspects. This complexity of quality and transformation as separate concepts makes the application of "quality as transformation" to higher education more difficult.

The curricula of teacher education need periodic transformations to respond to the evolution of educational research and national objectives. Teachers' perceptions relate to their competency in their subject matter play a decisive role in the success of any transformation [14]. The postgraduates' career paths, an outcome of post graduate education, have been viewed as an overlap of quality and transformation [10].

The description of career paths for chemistry education postgraduates (alumni) reflects the limited dispensable information [15, 16]. Internationally, some limited data on the career paths of university graduates and postgraduates are available [17, 18]. However, these data were not related to chemistry education degree programs, and the job prospects in Greece may differ from other countries. Therefore, the current research investigating the perceptions of postgraduates (alumni) about the quality of Master of Science program in "Chemistry Education, Information and Communication Technology and Education for Sustainable Development" (ChEd-ICT-ESD) that is organized by the Department of Chemistry at the National and Kapodistrian University of Athens (NKUA) in terms of their career paths after completing their programs may offer useful data for a transformation process.

3. Method

3.1 The context

The context of the current study is a three-semester Inter-Institutional Master of Science program in "Chemistry Education, Information and Communication Technology and Education for Sustainable Development" (ChEd-ICT-ESD) that is organized by the Department of Chemistry at the National and Kapodistrian University of Athens. The program aims at the professional development of postgraduate students and educates them in: (a) chemistry education research, (b) development new methods of teaching and assessment in chemistry, (c) connections between chemistry and chemical technology in everyday life, (d) development of education material using information and communication technologies, and (e) adoption of sustainable development goals in the teaching of chemistry.

3.2 The participants

The participants of this study were 70 responders, which had graduated in the period 2001-2022. Participation in the study was voluntary, without any kind of incentive given to participants.

3.3 The instrument

The data used in the study were collected through a questionnaire, which comprised three major parts. The first part asked for demographic information including gender and graduation year. The second part gathered information about responders' career paths after their graduation. The third part based on the 2-item ten-point linear scale ranging from 1 (not at all) to 10 (has a definitive role, to maximum degree) to capture respondents' perceptions concerning the impact of the master program both on their professional development and their practices. (Appendix). Questions were developed by the study team.

3.4 The procedure

In this study, a brief (~10 min) one-time online survey was conducted to capture data on the career paths of postgraduate students of Master of Science program in "ChEd-ICT-ESD". The survey was built upon the Google forms and was aligned with the "Code on Ethics and Good Practice" of NKUA. The survey was active from November to December 2022. A link to the questionnaire was e-mailed to postgraduates, whose e-mails were available from the Chemistry Department Administrative Office.



3.5 Data analysis

We used two methods of data analysis. SPSS (Statistical Package for Social Sciences), version 28.0.1.1 was used for the statistical analysis of quantitative data. Moreover, a content analysis was used for the questions that had an open format.

4. Results and discussion

Our results are presented following the three major parts of questionnaire described in the Method section.

4.1 First part

According to the demographic data, there were 41 females and 20 males out of 70 respondents (Fig.1). The graduation year distribution depicted that most of participants have been graduated in 2015 and one participant has been graduated in 2003, one in 2005, one in 2008 and one in 2017 (Fig.2)

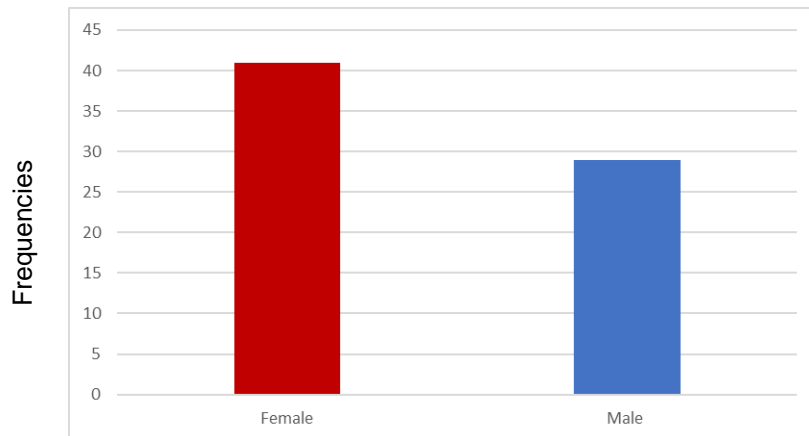


Fig.1. Gender distribution

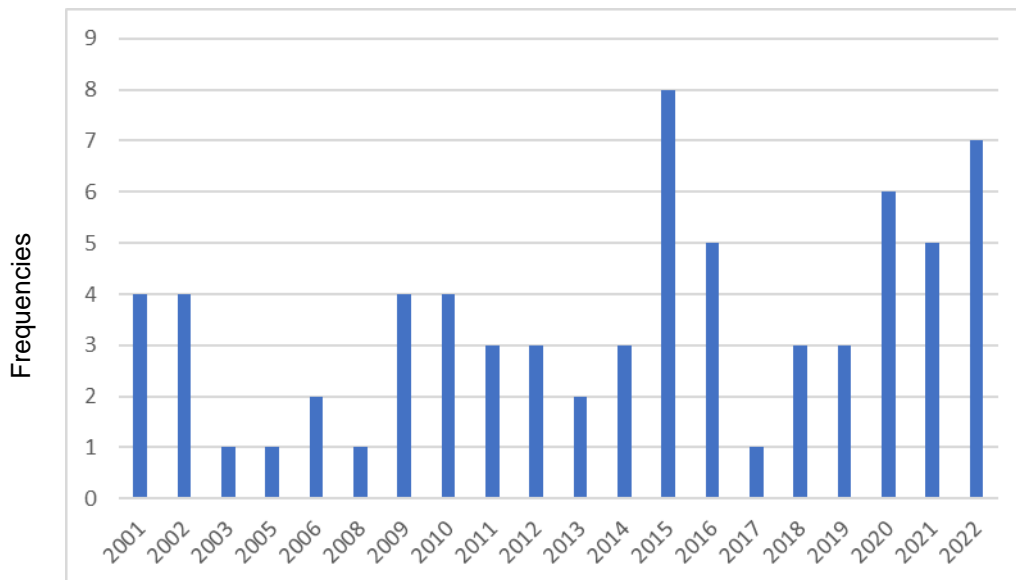


Fig. 2. Graduation year distribution

4.2 Second part

The frequency distribution of the Question 3 (Appendix) scores depicted that most participants have not been continued their studies after their graduation.

Table 1. Frequency of the Question 3 scores

	Frequency	Percent	Cumulative Percent
Undergraduate studies in another subject	2	2,9	2,9
Another master program	5	7,1	10,0



PhD at Chemistry Department	10	14,3	24,3
PhD at another Department	3	4,3	28,6
NO	50	71,4	100,0
Total	70	100,0	

Thirteen participants continued their studies in a PhD program (either at Chemistry Department or at another Department), five in another master program, and two did undergraduate studies in another subject (Table 1).

Table 2. Frequency of the Question 4 scores (Job position before graduation)

	Frequency	Percent	Cumulative Percent
Art Event coordinator	1	1,4	1,4
Dean in office at the Pedagogical Insti	1	1,4	2,9
Non-Governmental Organizations	1	1,4	4,3
Private lessons	4	5,7	10,0
Private sector	5	7,1	17,1
Project Manager	1	1,4	18,6
Research Institute	1	1,4	20,0
Secondary education in a private school	2	2,9	22,9
Secondary education in a public school	23	32,9	55,7
Secondary education in tutoring schools	27	38,6	94,3
Unemployed	4	5,7	100,0
Total	70	100,0	

Table 3. Frequency of the Question 5 scores (Job position after graduation)

	Frequency	Percent	Cumulative Percent
Dean in office at the Pedagogical Insti	1	1,4	1,4
Educational consultant - educational pr	1	1,4	2,9
Head of Science laboratories	1	1,4	4,3
Hellenic Center for Marine Research	1	1,4	5,7
Management responsibility (e.g. School	5	7,1	12,9
National Organization for Medicines	1	1,4	14,3
Non-formal education	1	1,4	15,7
Non-Governmental Organizations	1	1,4	17,1
Private sector	7	10,0	27,2
Research Institute	1	1,4	28,6
Science Laboratory Center (Director)	1	1,4	30,0
Scientific support custome training	1	1,4	31,5
Secondary education in a private school	5	7,1	38,6
Secondary education in a public school	30	42,9	81,5
Secondary education in tutoring schools	11	15,7	97,2
Unemployed	2	2,8	100,0
Total	70	100,0	

By a content analysis of the "other" choice's description (questions 3 and 4) were enriched the job positions of postgraduates as shown in Tables 3 and 4. Table 3 presents that before their graduation most postgraduates (38,6%) were employed in secondary education in tutoring schools, and these that were employed in secondary education in a public school followed (32,9%) . After graduation (Table 4), the percent of postgraduates that were employed in secondary education in a public school has been increased (42,9%) with simultaneously decreasing of the percentage of postgraduates that were employed in secondary education in tutoring schools (15,7%).

Table 4. Frequency of the Career Changes Scores

	Frequency	Percent	Cumulative Percent
They did not change job position	32	45,7	45,7
They changed job position	38	54,3	100,0



Total	70	100,0
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Comparing the participants' answers to questions 4 and 5, we created the variable "career changes". Most participants (54,3%) changed their job positions after their graduation (Table 4).

4.3 Third part

Table 5. Descriptive values for variables "Professional Development" and "Professional Practices"

	N	Range	Min.	Max.	Mean	Std. Deviation	Variance
Professional Development	70	9	1	10	7,56	2,224	4,946
Professional Practices	70	7	3	10	8,41	1,724	2,971

The analysis of the 2-item ten-point linear scale questions includes descriptive statistics presented in Table 5. Although the mean for the scale Professional Development was found to be 7,56, the mean for the scale Professional Practices was found to be 8,41. These results show that postgraduates were more positive about the impact of ChEd-ICT-ESD studies on the way they carry out their duties.

Table 6. Paired Samples t-test

	Paired Differences			t	df	Significance	
	Mean	Std. Deviation	Std. Error Mean			One-Sided p	Two-Sided p

A paired Samples t-test resulted that the more positive postgraduates' perceptions about the impact of ChEd-ICT-ESD studies on the way they carry out their duties is statistically significant.

Table 7. Independent Samples t-test (gender)

	Levene's Test for Equality of Variances		Independent Samples t-test			
	F	Sig.	t	df	Sig.	Mean Difference
						Professional Development
Professional Practices	1,485	0,227	-1,126	68	0,132	-0,470

Examination of effect of gender on postgraduates' perceptions about their "Professional Development" and "Professional Practices" resulted to no significant difference for both variables (Table 7).

Table 8. Independent Samples t-test (career changes)

	Levene's Test for Equality of Variances		Independent Samples t-test			
	F	Sig.	t	df	Sig.	Mean Difference
						Professional Development
Professional Practices	0,045	0,832	-0,590	68	0,279	-0,245

On the other hand, examination of effect of career changes on postgraduates' perceptions about their "Professional Development" and "Professional Practices" resulted to a significant effect of career changes on "Professional Development" variable (Table 8).

Table 9. Group Statistics

Career Changes		N	Mean	Std. Deviation
		Professional Development	They did not change job position	32
	They changed job position	38	8,29	1,707

The participants, which changed job position, possessed higher mean score (Table 9).

5. Conclusions

Based on this study there is an effect of the master program "Chemistry Education, Information and Communication Technology and Education for Sustainable Development" (ChEd-ICT-ESD) on the labour market outcomes in terms of postgraduates (alumni) career paths.



The postgraduates have more positive perceptions about the impact of their ChEd-ICT-ESD studies on the way they carry out their duties than on their professional development.

The career changes of postgraduates (alumni) affect only their perceptions about the impact of the master program on their professional development.

Our results can have policy implications at the national and institutional levels in terms of qualification frameworks of chemistry teachers, curricula, and institutional support for their career development based on ChEd-ICT-ESD master program. Although quality is a positive concept generally, it is "catastrophic" when it involves external audits and measurement by state-imposed standards [19]. A new approach, which places more emphasis on understanding the essential quality of a program, informed by research, to ensure improvement of the learning will make a substantial contribution to the debate about quality evaluation [20]. Maybe the quality evaluation needs to be research-based like this study.

Although the weak point of this research is the low response rate of alumni which was mainly due to bad contact information, Lambert and Miller (2014) suggest that the differences of the response rates do not affect the representativeness of the results [21].

6. Appendix

6.1 First part

Question 1: Gender

Female	1
Male	2

Question 2: Graduation year

2001	
2002	
2003	
2004	
2005	
2006	
2007	
2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	
2021	
2022	

6.2 Second part

Question 3: After graduating from ChEd-ICT-ESD you continued your studies

Undergraduate studies in another subject	1
Another master programme	2
PhD at Chemistry Department	3
PhD at another Department	4
NO	5

Question 4: Job position before graduation.

Secondary education in a public school	
Secondary education in a private school	
Secondary education in tutoring schools	
Higher education	



Science Laboratory Center (Director)	
Educational consultant - educational project coordinator	
Management responsibility (e.g. School Director)	
Other	Detail description

Question 5: Job position obtained after graduation.

Secondary education in a public school	
Secondary education in a private school	
Secondary education in tutoring schools	
Higher education	
Science Laboratory Center (Director)	
Educational consultant - educational project coordinator	
Management responsibility (e.g. School Director)	
Other	Detail description

6.3 Third part

Question 6: The ChEd-ICT-ESD degree helped you in your professional development.

1	2	3	4	5	6	7	8	9	10
Not at all									Has a definitive role

Question 7: The knowledge you acquired during ChEd-ICT-ESD studies affect the way you carry out your duties.

1	2	3	4	5	6	7	8	9	10
Not at all									To maximum degree

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