



Entrepreneurship Based on Traditional Iranian Medicine Manuscripts: Winter Startup 2016 by Phytopharmaceutical Technology and Traditional Medicine Incubator (Shiraz)

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Abstract

Ancient and medieval medical Iranian manuscripts are of great importance for research and study in two academic fields of Traditional Iranian Medicine and Pharmacy. Nowadays, products based on these manuscripts such as monographs, databases, software packages, and statistical analyses for drug screening are predicted to have entrepreneurial potential. In winter 2016, Phytopharmaceutical Technology and Traditional Medicine Incubator held a one-week startup in order to train twenty undergraduate students how to use ancient medical manuscripts for writing one standard monograph of a medicinal plant. Also, they came up with productive ideas based on using manuscripts, and after that, they worked on writing a business plan and business model of their suggested product.

Keywords: Traditional Iranian Medicine, Medical Manuscripts, Entrepreneurship, Startup

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Introduction

Traditional Medicine (TM) of Persia, one of the therapeutic systems throughout the world, is mainly based on ancient and medieval medical

manuscripts which are of great importance for research and study in two academic fields of Traditional Iranian Medicine and Pharmacy (TIM and TIP). These written works, in Persian

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or Arabic, can be found in domestic libraries and museums like Library, Museum and Document Center of Iran Parliament or in overseas ones such as National Library of Medicine [1]. However, a large number of them are still not easy to use, and they are in the form of ancient handwritten books or lithography printing. Nowadays, because of the increasing number of users, any attempts of rewriting, translating, and digitizing ancient books are highly encouraged. Other products of professional level such as monographs, databases, software packages, and statistical analyses for drug screening and also for treatment approach extracting are predicted to have entrepreneurial potential.

In order to develop such products, various obstacles exist. First, because of the newness of the field, the number of trained human resources of this area is limited. The second problem, lack of strong productive teamwork, makes such projects impossible to run. The next barrier is students' and graduates' unawareness of enterprise rules, business requirements, entrepreneurial ecosystems, and target markets. The last but not the least issue is the inability to have creative designs [2]. Having many capacities, universities can remove parts of the above-mentioned barriers and create new products and business opportunities. Incubators, the structures between university and markets, play a crucial role in related activities [3]. Supporting plans for small-medium enterprises (SMEs) are remarkably welcoming in developing countries [4].

In winter 2016, Phytopharmaceutical Technology and Traditional Medicine Incubator (PTTMI) of Shiraz University of Medical Sciences (SUMS) held a one-week startup entitled "*From Library to Laboratory*" for undergraduate pharmacy and medicine students in order to teach them how to extract essential information for writing a medicinal plant monograph from more than 60 TM manuscripts and also from recent references, what new ideas

are possible to come up with and what new products have potentials of development. The present article deals with different aspects of this program, approaches to the above-mentioned obstacles, the implementation process, the outcomes obtained from the program, and the impact of the work.

Methods

Entrance exam: After program announcement, the applicants who were pharmacy and medicine undergraduate students of SUMS took a two-part examination, an online written test and an oral exam, where the ability of a scientific concept simplification, capability of team-forming and team-working, and creativity were assessed. The examiners, 3 Production Committee members of PTTMI, performed the evaluation process separately. Finally, 18 pharmacy students and 2 medical students were accepted to attend the one-week program.

Courses: According to the objectives, 4 teaching sessions including a short visit were planned. General topics titled creativity, innovation, and business ethics in Islam were taught in one session. Next, the students learnt step by step how to write one standard monograph of a medicinal plant for Medical Encyclopedia of Iran and Islam. Topics of this course are mentioned in Table 1/ session 2. A TIP professor accompanied by 3 assistants (a traditional pharmacist, a traditional physician, and a botanist) performed this 18-hour workshop. The third workshop had been designed for group work. Students formed 3 groups and thought of new products using ancient and medieval medical manuscripts. Also, they participated in 2 workshops entitled "How to Design a Business Model and, How to Write a Business Plan" for their own products. Finally, they had a three-hour visit from a quality control laboratory of SUMS. Details of course topics are summarized in Table 2.

Table 1. Course topics of 4 sessions presented in winter startup 2016 (h: hour)

Session	Course topics	Course period
1	Creativity and innovation	3h
	Business ethics in Islam	3h
2	Materia Medica (<i>Mofradat</i>)	8h
	Multi-ingredient books (<i>Qarabadin</i>)	2h
	Scientific nomenclature of ancient botanicals	2h
	Equivalent titles for ancient diseases	2h
	How to cite references for encyclopedia	2h
	Medicinal plant monograph writing method	2h
3	Productive ideas using ancient medical manuscripts	3h
	Business model workshop	3h
	Business Plan workshop	3h
4	Quality control laboratory: a visit	3h

Tasks: Twenty titles of medicinal plant monographs were randomly distributed among students (Table 3). These monographs of Medical Encyclopedia of Iran and Islam had been ordered by the Academy of Medical Sciences of Islamic Republic of Iran. This to-be-four-volume encyclopedia has 2000 monographs of 9 different categories, one of

which is medicinal plants [5]. Each student learnt how to use ancient manuscripts and also up-to-date references in order to prepare their own monograph. The 7-step process of providing a medicinal herb monograph including main references used for this task is summarized in Table 2.

Table 2. Sources used for writing medicinal plant monographs for Medical Encyclopedia of Iran and Islam
 A: Arabic; Av: Avestan; C.A.: Committee of Authors; E: English; F: French; G: German; L: Latin; P: Persian; Pa: Pahlavi.

	Monograph Details	Reference/Manuscript	Author	Century/ year	Language
<i>STEP 1: Traditional Medicine Knowledge from Written Works</i>	1.ancient name(s) of materia medica in different languages 2.route of name 3.temperament 4.therapeutic effects	1.De Materia Medica	Pedanius Dioscorides	56	A
		2.De Materia Medica (translation)	Hunayn ibn Ishaq	9 th	A
		3.Ketab al-Abnia an Haqaeq al-Adwia	Abu Mansur Movaffaq Heravi	10 th	P
		4.Al Mansuri fi Tib	Rhazes	10 th	P
		5.Al-Hawi	Rhazes	10 th	A
		6.Zakhireye Kharazmshahi	Sayyed Ismail Jorgani	11 th	P
		7.Al-Aghraz al-Tibbia wa-al Mabahess al-Alaiia	Sayyed Ismail Jorgani	11 th	P
		8.Taqwim al-Sihhah	Ibn Butlan	11 th	A
		9.The Canon of Medicine (vol.2)	Avicenna (Ibn Sina)	1025	A
		10.Kitab fi al-Adwiyah al-Mufradah	Abu Ja'far al-Ghafiqi	12 th	A
		11.Kitab al-Jami li-Mufradat al-Adwiya wa al-Aghdhiya	Ibn al-Baitar	13 th	A
		12.Ikhtiarat e Badi'e	Ansari Shirazi	13 th	P
		13.Umdat al-Tabib fi Marifat al-Nabat	Abu l-Khayr al-Ishbili	12 th	A
		14.Hadiqat al-Azhar fi Mahiyyat al-Ushb wa-l-Aqqar	Abul Qasim ibn Mohammed al-Ghassani	16 th	A
		15.Tadhkira	Dawud Ibn Umar al-Antaki	1600	A
		16.Tohfa-al Momenin	Sayyed Mohammad Momen Tonekaboni	1632	P

	5.mechanism of action	17.Makhzn-al Adviyeh	Mir Mohammad Hosein Aghili	1772	P
	6.potential side effects	18.Khazaen Al-Molouk	Shams al-Din Ahmad	19 th	P
		19.Terminologie Medico-Pharmaceutique et Anthropologique	Johan Louis Schlimmer	1874	F/P
	7.modifiers		William Dymock C.J.H. Warden David Hooper	1890	E
	8.dosage forms	20. Pharmacographia Indica		1891	P
	9.dosage	21.Majma-al Adwia Nascri	Alireza Khan Tafreshi	1897	P
		22. Pezeshki Nameh	Mirza Ali Akbar Khan Nafisi	<1896	P
	10.alternatives	23.Asma-al Adwia	Hakim Azam Khan	1896	P
		24.Mohit Azam	Ahmad Isa Bak	1930	A/E/F/L
		25.Mojam al-Asma al-Nabat	David Hooper	1937	E
		26.Useful Plants of Iran and Iraq	Armenag K.Bedevian	1994	A/L/E/F/G
		27.Illustrated Polyglottic Dictionary of Plant Names	Valiollah Mozaffarian	1998	E/L/P
		28. Dictionary of Iranian Plant Names	Abolghasem Soltani	2008	E/F/G/P
	P 2: History		30.Gathas	Zoroastrian literature	7 th -8 th
		31.Avesta	Zoroastrian literature	?	Av
	11.Historical records of materia medica	32.Visperad	Zoroastrian literature	226-651	Av
		33.Yasht	Zoroastrian literature	648-330 BC	Av
		34.Yasna	Zoroastrian literature	?	Av
		35. Bundahishn	Zoroastrian literature	862-881	Pa
		36. Irshad-al Ziraat	Ghasem AbouNasri Herawi	1515	P
		37. Borhane Ghate	Mohammad Hosain Khalaf Tabrizi	1621	P
		38.Pharmacographia Indica	William Dymock C.J.H. Warden David Hooper	1893	E
		39.Dehhoda Dictionary	Ali Akbar Dehhoda	1939-	P
		40.Moeen Encyclopedia	Mohammad Moeen	1972	P
		41.Encyclopaedia of Medicinal Plants	Roberto Chiej	1984	E
		42.Al Mostalah-al Aajami fi Kitab-al-Tibb wa al-Saidali al-Arabia	Ibrahim ibn Morad	1985	A
STEP 3: Identification of Scientific Names	12.Matching Old and Scientific Description	43.Encyclopedia of Traditional Medicine (Medicinal Plants)	Abolghasem Soltani	2008	P
		44.Kitab-al Saydana fi Tibb	Abu Rayhan Al-Biruni	10 th -11 th	A
	13.Scientific Name of Materia Medica	45.Makhzn al-Adviyeh	Mir Mohammad Hosein Aghili	1772	P
		46.Pharmacographia Indica	William Dymock C.J.H. Warden David Hooper	1893	E
	14.Meaning of Scientific Names (if found)	47.Useful Plants of Iran and Iraq	David Hooper	1937	E
		48.Dictionary of Iranian Plant names	Valiollah Mozaffarian	1998	E/L/P
STEP 4: Botany	16.Botanical Description	49.Matching the Old Descriptions of Medicinal Plants with the Scientific Ones	Ahmad Ghahraman Ahmad Reza Okhovvat	2004(V1) 2009(V2)	P
		50.Popular Medicinal Plants of Iran	Gholamreza Amin	2008	P
		51.Flora Iranica	Karl Heinz Rechinger	1963-	E
	17.Geobotany	52.Forests, Trees, and Shrubs of Iran	Habibollah Sabeti	1994	P
		53.Identification of Medicinal and Aromatic Plants of Iran	Valiollah Mozaffarian	2012	P
54. http://flora-iran.com/					
55. www.eFloras.org/Flora of Pakistan					
56. www.tropicos.org					
57. http://www.e-journals.org/Botany					

STEP 5: Ancient Multi-Component Formulation	18.Multi-Ingredient Formulation on Materia Medica Basis 19.Therapeutical Effects 20.Component Proportion 21.Production Method 22.Dosage 23.Processing Time 24.Expiration Date	58.Sanat-al Adwia-al Morakabe	Shapur ibn Sahl	9 th	A
		59. Kitab Kamil aş-Şinaa at-Tibbiyya	Ali ibn al-Abbas al-Majusi	980	A
		60.The Canon of Medicine (vol.5)	Avicenna (Ibn Sina)	1025	A
		61. Qarabadin al-Kindi	Abu Yusuf al-Kindī	15 th	A
		62.Qarabadin Shafae	Mazhar ibn Mohammad Shafae Isfahani	<1627	P
		63.Qarabadin Salehi	Sale ibn Mohammad Ghaeni Herawi	1766	P
		64.Qarabadin Kabir	Mir Mohammad Hoscin Aghili	1781	P
		65.Qarabadin Ghaderi	Mohammad Akbar Shah Arzani	18 th	P
		66. Qarabadin Azam	Hakim Azam Khan	1853	P
		67.Tibb Faridi	Hakim Farid-al Din	19 th	P
68.Hamdard Pharmacopoeia of Eastern Medicine	Hakim Mohammad Said	1970	E		
STEP 6: Ancient Disease	25.Brief Description of Ancient Diseases which the Materia Medica is suggested for 26.New Equivalent of Ancient Diseases	69.The Canon of Medicine	Avicenna (Ibn Sina)	1025	A
		70.Tibb Akbari	Mohammad Akbar Shah Arzani	1701	P
		71.Moalejat Aghili	Mir Mohammad Hoscin Aghili	18 th	P
		72.Romouz Azam	Hakim Azam Khan	1848	P
		73.Exir Azam	Hakim Azam Khan	1868	P
		74.Traditional Iranian Medicine Manual	Fatemeh Nejatbakhsh Marzie Beigom Siahpoush	2014	P
STEP 7: Recent Finding	27.Cemical Constituents 28.Therapeutic effects 30. <i>In vitro</i> tests 31.Animal Studies 32. Clinical trials 33. Side Effects 34.Toxicity 35.Contraindication 36.Approved Products 37.Considerations during Pregnancy and lactation	75.Medicinal Plants (5 th ed.)	Ali Zargari	1995	P
		76.Herbal Medicine (2 nd ed.)	Rudolf Fritz Weiss Volker Fintelman	2000	E
		77.Iran Herbal Pharmacopeia	C.A.	2002	P
		78.Rational Phytotherapy: A Reference Guide for Physicians and Pharmacists (5 th ed.)	Mark Blumenthal Rudolf Haensel Varro. E. Tyler Volker Schultz	2004	E
		79.Martindale: The Complete Drug Reference	C.A.	2007	E
		80.Teedrogen und Phytopharmaka (5 th ed.)	Max Wichtl	2009	G
		81. Pharmakognosie Phytopharmazie (9 th ed.)	Rudolf Haensel Otto Sticher	2010	G
		82.Herbal Medicines (4 th ed.)	C.A	2013	E
		83.Related Articles from web search engines			

Students' assessment: Monographs prepared by students were evaluated and authenticated by 2 reviewers from the Academy of Medical Sciences of Islamic Republic of Iran. Also, in another evaluation session, business plans designed by 3 groups of students were analyzed based on their strengths and weaknesses. An invited venture capital was responsible for ranking business plans.

Results

The main gain of Winter School 2016 was training undergraduate students, 18 pharmacy and 2 medicine students, how to extract essential information from mentioned references (Table

2) to write their own monograph. After being edited by a reviewer from the Academy of Medical Sciences of Islamic Republic of Iran, all the 20 monographs were accepted for Medical Encyclopedia of Iran and Islam. Prepared medicinal plant monographs are listed in Table 3. Also, students in three groups came up with productive ideas using ancient medical manuscripts, and after that, they worked on writing the business plan and business model of their own products including a comprehensive electronic dictionary for ancient medical terminology, a software package, and a multi-lingual data bank of TIM books.

Table 3. Monographs of medicinal plants written by students during winter startup for Medical Encyclopedia of Iran and Islam

	Monograph titles	Scientific names
1	Khorfe	<i>Portulaca oleracea</i> L.
2	Kharnoob	<i>Ceratonia siliqua</i> L.
3	Khosi-o-saalab	<i>Tulipa gesneriana</i> L.
4	Darchin	<i>Cinnamomum verum</i> J.Presl
5	Darfefel	<i>Piper longum</i> L.
6	Dand	<i>Croton tiglium</i> L.
7	Zanbolkehil	<i>Equisetum arvense</i> L.
8	Ratianaj	<i>Pinus roxburghii</i> Sarg.
9	Raziane	<i>Foeniculum vulgare</i> Mill.
10	Rasan	<i>Imula helenium</i> L.
11	Reihan	<i>Ocimum basilicum</i> L.
12	Rivas	<i>Rheum ribes</i> L.
13	Zaban Gonjeshk	<i>Fraxinus excelsior</i> L.
14	Zaravand	<i>Aristolochia longa</i> L. <i>Aristolochia rotunda</i> L.
15	Zardchoobeh	<i>Curcuma longa</i> L.
16	Zereshk	<i>Berberis vulgaris</i> L.
17	Zaaroor	<i>Crataegus azarolus</i> L.
18	Zenyan	<i>Trachyspermum copticum</i> L.
19	Zoofa	<i>Hyssopus officinalis</i> L.
20	Sepestan	<i>Cordia myxa</i> L.

Discussion

TIM and TIP are going to provide various business opportunities, both in service and production sectors. These activities such as supporting entrepreneurs and helping startup companies, mainly organized in incubators or science & technology parks, are intensively welcomed in a country with a large young population [6]. In the past decade, economic problems, excessive number of graduates, unemployment crisis, governmental policies toward downsizing its structure, and private sector inability to provide job opportunities have caused paying more attention to entrepreneurship [7]. PTTMI planned to hold the Winter Startup 2016 in order to empower entrepreneurial ecosystem of TIM and TIP. In this program, 20 undergraduate students became familiar with important references of TIM, and they were trained to read and use the above-mentioned manuscripts which were mainly in lithography prints. Also, 6- and 8-student groups provided innovative and creative ideas of a

product and worked on business models and business plans. Such programs enable students to deal with business challenges and think about the creation of many more new job opportunities. In the summer 2016, 9 of these 20 graduates established two new startup companies supported by PTTMI of SUMS.†

Conflicts of Interest

Authors have no conflict of interests.

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