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< Report >

Criteria for Doctoral Degree Qualification

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博士学位修了基準調査

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Japanese Abstract: 大学院教育イニシアティブセンターでは、優秀な学生の育成のために、方法論、研究の教育、教育の評価基準を改善していくことを目標としている。我々は科学的な客観的、透明性が高く、質保証された博士の学位授与の基準の開発に向けて科学的なアプローチを採っている。我々は質問紙調査、ウェブ調査、そしてインタビューを通して国内外の大学院から情報を収集した。その後、これらのデータに基づき分析をし、その結果基準を得た。本発表において、これまでに得られた我々の知見を紹介する。初年度は、主としてアンケートを用いた調査を行い、2010年度のCGEIアニュアルレポートで報告した。二年目の2011年度は、32の大学院、そのうち15はアフリカ、13は中東の国々を対象としたウェブ調査を実施した。この結果は2011年12月の国際会議で発表し、昨年度のアニュアルレポートでも報告した。ここでは、さらに日本、シンガポールの大学院を対象としたウェブ調査の結果についてここで報告する。

日本語訳：鍋田 智広（大学院教育イニシアティブセンター 特任助教）

[Key Words: Quality assurance, Doctoral degree, Qualification criteria, Scientific-based approach]

Abstract: At the Centre for Graduate Education Initiative (CGEI) our goals include improvement of methodologies, research instructions, and assessment criteria for graduate education in order to cultivate students of high caliber. Towards the latter, we are conducting a scientific-based approach to develop a criterion for doctoral qualification that is objective, transparent and quality-assured. We are gathering relevant information from both domestic and overseas graduate institutions on eligibility for admission and graduation criteria for doctoral programs. This survey is in its third year. During the first year of study, we conducted mainly a questionnaire-based survey, and we reported the preliminary findings in the CGEI 2010 Annual Report. During the

second year, we reported on findings obtained using a web-based survey from 32 graduate institutions in 15 African and 13 Middle Eastern countries. The findings were presented at an International conference in December, 2011. They were also published in the CGEI 2011 Annual Report. We have since conducted more web-based survey on Japanese and Singapore graduate institutions. Here-in, we report these findings.

1 Introduction

Rigorous pursuit of quality assurance in graduate education for both master's and doctorate degree programs is crucial in fostering competitive human resources. Since its establishment, JAIST has made major contributions toward the advancement of leading-edge graduate education. At the Center for Graduate Education Initiative, we are working for continual development and implementation of graduate education based on the experience of JAIST. Towards this end, among many activities, we are establishing methodologies and research instructions for graduate education that aid in cultivating students of high caliber. Of additional importance to our work, is the assessment criteria used for qualifying the students. We aim to develop an objective and transparent quality-assured assessment system.

Recognition of the importance of obtaining such information is reflected in the amount of effort being invested in Europe and others. For example, the EAU and the Coimbra Group's Task Force for Doctoral Studies and Research are conducting a mapping of doctoral education in Europe. Thirty-seven long-established, multidisciplinary European universities constitute the Coimbra Group. With globalization of education where national and cultural borders are becoming less relevant, and student as well as faculty mobility has increased greatly, there is a need to embrace this inevitable change [1]. There is increased realization that education and creativity are more important than natural resources, and corporations/employers have themselves become globalised [2]. Employers expect faculty/graduates to have the ability to work in a flattened world [3]. One of the ways to further promote cross national and cultural border movement by creating a unified criteria for assessing students. This would allow easy transferability of credit/qualification, and also employment. Educators will need to (i) be 'educated' to current credit/qualification systems around the globe, (ii) be creative in their research in order to engage in research issues that are global in global nature, and (iii) to collaborate actively at an international scale. The Bologna process in Europe is making mobility and cross-cultural experience possible, at a European-wide scale [4].

In order to develop a quality-assured criteria for doctoral degree qualification in JAIST, we are taking a scientific-based approach. We are gathering relevant information from both domestic and overseas graduate institutions through questionnaire surveys, web-based research, and personal communication. After, we will carryout analyses based on having collected sufficient information, and develop the criterion accordingly. During the first year of study, we conducted mainly a questionnaire-based survey, and we reported the preliminary

findings in the CGEI 2010 Annual Report. During the second year, we reported on findings obtained using a web-based survey from 32 graduate institutions in 15 African and 13 Middle Eastern countries. The findings were presented at an International conference in December, 2011 [6]. We have since conducted more web-based survey on South Korean, Japanese and Singapore graduate institutions. Here-in, we report these findings.

2 Methodology

We used a web-based survey to conduct the research. We classified areas of study into seven regions. From each region, a few countries were selected. Top-ranked graduate institutions were then chosen from each selected country. All in all, 217 graduate institutions were selected on South Korean, Japanese and Singapore graduate institutions. Since then, we have conducted a survey of other graduate institutions in United Kingdom, USA, and Australia. The survey is on-going. We hope to submit our most recent findings for consideration for oral presentation at an international conference this year.

Table 1. Classification of regions, the number of countries and graduate institutions selected for the study

3 Results

3.1 Japanese graduate institutions

We surveyed ten graduate institutions in Japan (Table 1). In each university, we studied two departments taken from STEM.

Table 1 Departments surveyed in the selected Japanese universities

| Country | University | Department(Course) |
|---------|---------------------|-------------------------|
| Japan | Osaka | Mathematics |
| | | Applied Physics |
| | Kyoto | Mathematics |
| | | Pharmaceutical Sciences |
| | Nagoya | Mathematics |
| | | Applied Physics |
| | Tokyo | Mathematics |
| | | Applied Physics |
| | Hiroshima | Biosphere Science |
| | | Information Engineering |
| JAIST | Material Science | |
| | Information Science | |

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The eligibility criteria for admission is summarized in Figure 1. As can be seen, all departments surveyed needed the students to have transcripts as well as a Master’s degree. A master’s thesis is required in 64% of total. The requirement for English proficiency was at 45%, that is just less than half the departments required their students to have a ‘certain’ level of English proficiency.

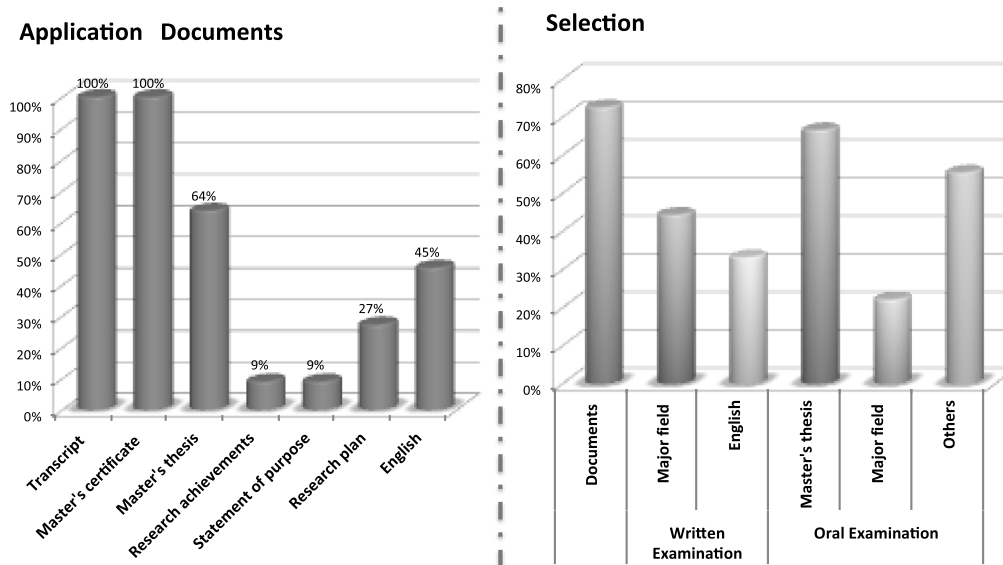
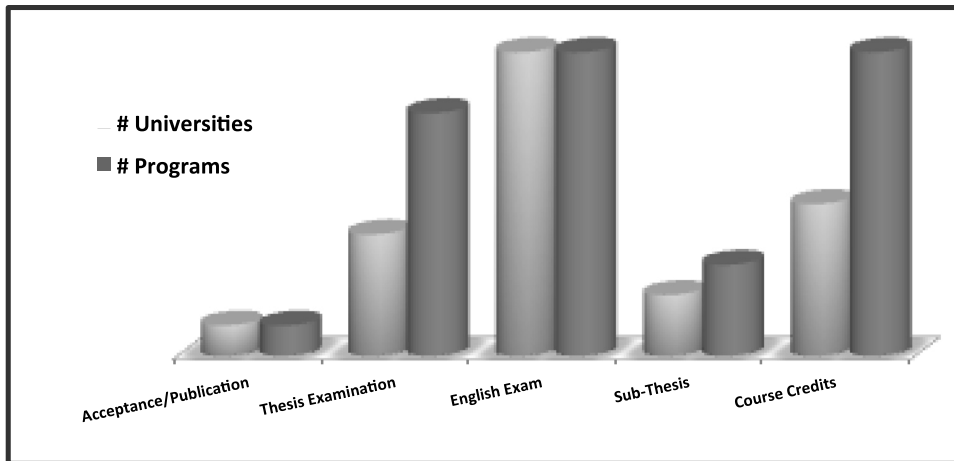


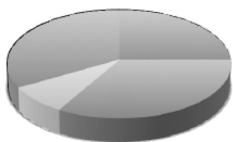
Figure 1. Eligibility criteria for admission into PhD programs in ten Japanese institutions. The list of these institutions can be seen in Table 2. The list of these institutions can be seen in Table 2.

Please note that these results are from a web-based survey and some institutions (or departments) may not necessarily explicitly note some eligibility requirements on their web sites. This is one of the flaws of this type of survey.

In contrast with the eligibility criteria for admission, all departments had passing of an English examination as a criteria for graduation (Figure 2). Thesis examination and having enough course credits were also highly rated. The final examination was conducted by at least 2 examiners in all departments. There wasn't enough information regarding whether some of the examiners were external to the institutions.



Final Examination (written/oral)



■ both ■ either ■ None ■ Not specified

Examination Committee

| No. Examiners | No. Programs |
|---------------|--------------|
| 2 | 3 |
| 3 | 5 |
| 5 | 4 |

Figure 2. Criteria for doctoral degree qualification in ten Japanese institutions (top). Bottom left pie chart shows the type of final examination given to students and the number of examiners needed for each of the programs (bottom right).

3.2 Singapore graduate institutions

We surveyed two graduate institutes in Singapore.

3.2.1 National University of Singapore (NUS)

At National University of Singapore (NUS), we surveyed the Department of Biological Sciences only because it was the only department from STEM that had the information we were looking for from their web sites. Figure 3 gives a summary of the eligibility for admission and graduation criteria for a PhD in Biological Sciences.

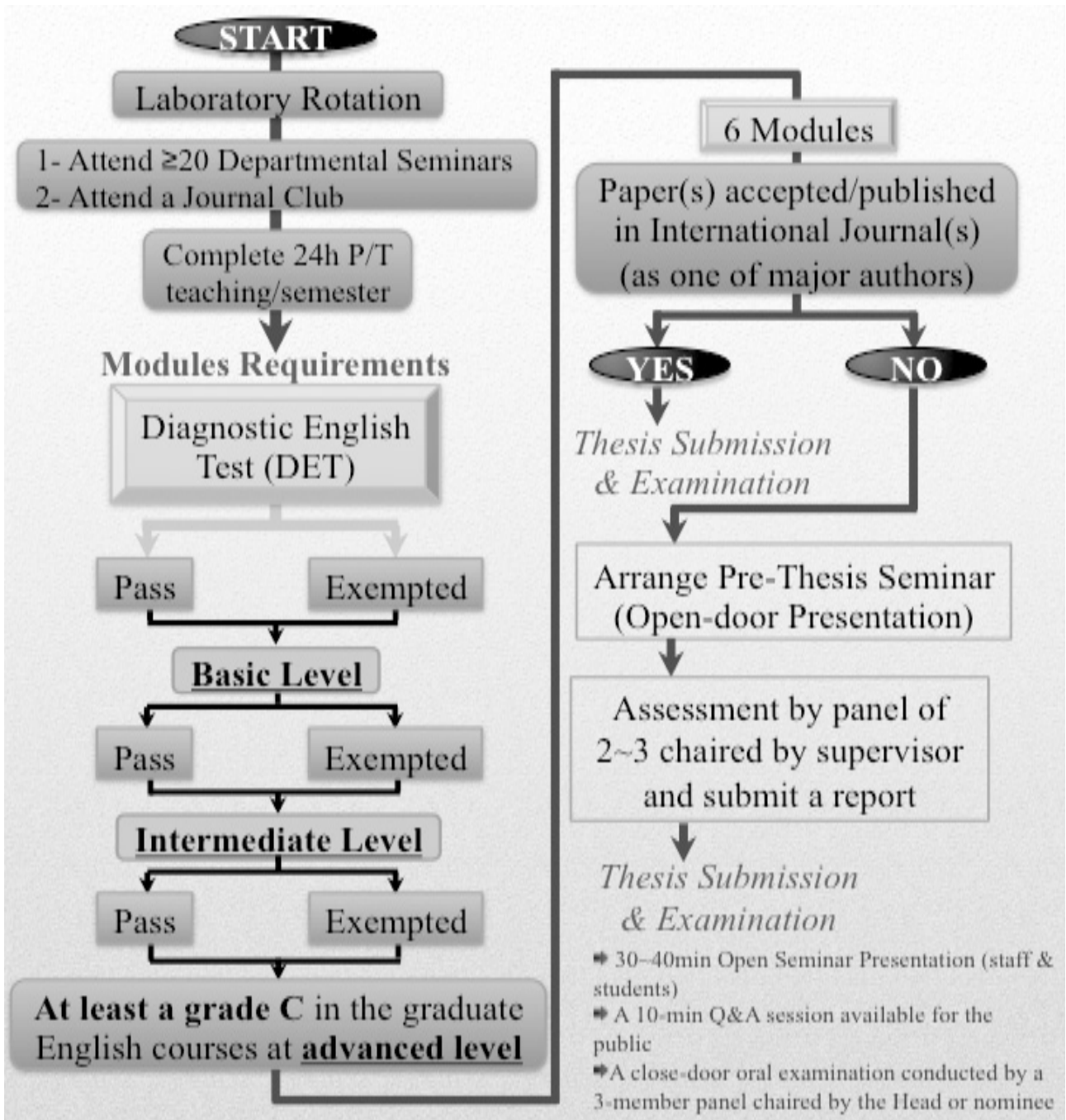


Figure 3. Eligibility criteria for admission and graduation requirements for PhD program in Biological Sciences at the National University of Singapore

3.2.2 Nanyang Technical University (NTU)

Similar to NUS, at Nanyang Technical University (NTU), we surveyed the Department of Computer Science only because it was the only department from STEM that had the information we were looking for from their web sites (Table 2).

Table 2. The structure of PhD degree program in Computer Science at NTU, Singapore

| Structure of PhD Program (Computer Science) | | |
|---|------------|--|
| Year 1 | Semester 1 | 2 PG Modules + Ph.D. Qualifying Examination I (QE I) + Elementary Research |
| | Semester 2 | 2 PG Modules + Ph.D. Qualifying Examination I (QE I) + Research |
| Year 2 | Semester 1 | 2 PG Modules + GRP (QE II) + Research |
| | Semester 2 | 2 PG Modules + Research |
| Year 3 | Semester 1 | Research |
| | Semester 2 | Research + Thesis Proposal + Doctoral Seminar |
| Year 4 | Semester 1 | Research |
| | Semester 2 | Pre-Submission Presentation (before thesis submission) |
| | | Ph.D. Defense (Seminar Presentation + Oral Defense) |

Figure 4 shows the course of the program at each juncture, leading to graduation. At the bottom of the figure, we can see other requirements such as the need for a good publication, a good paper presented at an international conference, as well as completion of 6 courses.



Figure 4. Doctoral degree study map and graduation requirements and for PhD program in Computer Science at Nanyang Technical University, Singapore

For both of the Singapore graduate institutes, there were some additional features of interest (Figure 5)

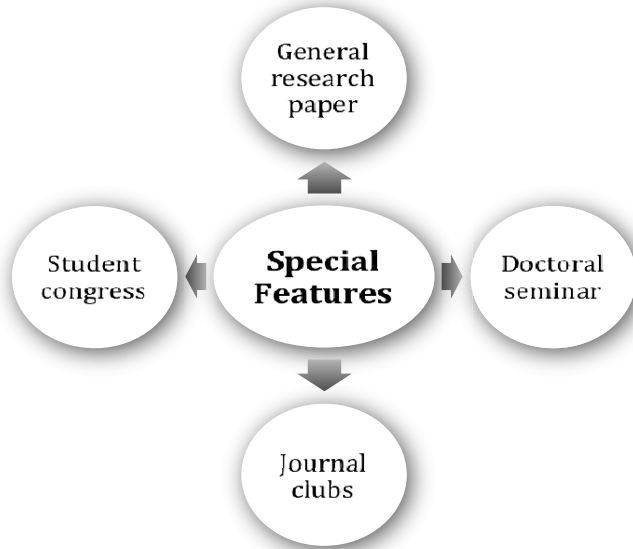


Figure 5. Some additional characteristics from the Singapore Universities.

3.3 Some transferable activities that could be considered at JAIST

During the survey of the regions we have reported above, and also including some institutions in USA, UK, and Singapore, we identified some interesting special features in some of the institutes that could be easily adapted to fit in the JAIST education system in order to improve the quality of students graduating from JAIST, as well as their employability potential (Table 3). Some of these features are already in place in some of the Schools in JAIST, in some form or another. For example, in JAIST there is a sub theme project aimed to widen students knowledge and experience. This is in some way similar to what we identified in some institutions (eg., American University of Beirut, MIT, University of Oxford, Yale University, Harvard University) as laboratory rotation. Students are required to rotate between a number of laboratories for extended periods of time in order to broaden their scope, be exposed to various supervisors, and establish valuable connections. For example at Harvard, students have 2 to 4 laboratory rotations, each lasting at least 8 to 10 weeks. Another very important activity for students is teaching experience. This is one of the criteria for doctoral qualification at American University of Beirut, MIT, University of Oxford, Yale University and Harvard University. This officially-recognized experience confers the students an employment advantage over their counterparts who do not have such an experience, especially for academic positions. JAIST being a graduate only institution does not have similar opportunities for its PhD students. Could semi-formal and officially recognized laboratory-based or section-based teaching be an

answer for JAIST? In the School of Materials Science for example, these could include lectures on disposal of waste materials, some common laboratory instrumentation, clean-room usage & protocols, cell-culture cultivation and DNA PCR techniques. Simpler, yet effective activities could include institution-wide Poster competition with awards. To add extra experience in terms of ownership, management and leadership, students could organize these poster competitions themselves, with members of faculty playing the supportive roles and mentorship.

Table 3. Some transferable skills activities that could be considered at JAIST

| Activity | Examples of possible benefits |
|--|--|
| Providing research talk to department | Communication, technical, sales skills, and networking opportunities |
| Laboratory rotation | Wider experience and knowledge |
| Attending/participating in departmental seminars | Wider experience, networking, communication |
| Teaching experience (Classroom or Lab) | Communication, technical, leadership, engagement |
| English language requirement | Communication, confidence |
| Student conference with awards | Leadership, management, motivation, communication, networking, ownership |
| Poster competition with awards | Leadership, management, motivation, communication, networking, ownership |
| Attend transferable skills training | Wider experience and knowledge |

We have since formed a Transferable Skills Project group to move through some of the activities outlined about. This will be reported separately in this annual report.

4 Concluding Remarks

Our initial efforts show a diversity in the doctoral education programs carried out in institutions around the world. The results also show that most institutions conduct the final doctoral examination orally. We have noted a variety of other requirements that students must attain before qualifying for a doctorate. These include English qualifications, and a variety of interim exams. After the research and subsequent analyses, we will propose an evidence-based criteria for doctoral degree qualification for JAIST. Our proposal will also reflect, in addition, on-going efforts around the world. These activities include the mapping of doctoral degree programs in Europe and USA, and the credit transfer systems in Europe and other regions. Our aim is to lead

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the way forward in advancing graduate education, globally.

The activities that we undertake at CGEI, specific to establishing a quality-assured criteria for doctoral degree qualification at JAIST, also hold the potential to contribute at a global level. We aim to have the findings reported in an international journal or at an international conference.

5 Acknowledgements

I gratefully acknowledge CGEI Research Assistant Ms. Samarat Kouthar and Ms. Fumiko Kataoka for help in conducting the web-based survey.

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