INDIANA UNIVERSITY

SCHOOL OF EDUCATION

Assessing Multinational Interest in STEM: Implementing a Comparative Survey Research Study in China

Adam V. Maltese, Heidi A. Ross, Yimin Wang, and Lei Wang, Indiana University

INTRODUCTION AND OUTLINE

We introduce the design and implementation **of a comparative survey project in U.S., China, Australia called AMISTEM, Assessing Multinational Interest in STEM (Science, Technology, Engineering, and Mathematics)** that is being lead by researchers at Indiana University.

Four Presentations Today and Tomorrow:

1. backdrop: how survey research has developed in China during past 2 decades, especially higher education.
2. aims of AMISTEM and challenges in "internationalizing" it: implementing the study in Chinese universities
3. challenges of translation and cultural adaptation of survey
4. *preliminary findings to be shared tomorrow*

INDIANA UNIVERSITY

SCHOOL OF EDUCATION

I. Survey Research in Chinese Higher Education Literature, 1990 to 2012
问卷调查研究在中国高等教育中的使用（1990 至 2012）

Heidi Ross and Yimin Wang

Indiana University

综述

- 在这一部分的报告中，我们总结分析中国高等教育领域的学者怎样使用问卷调查这一研究方法。
- 聚焦在教与学的过程中，问卷调查这一研究方法在哪些课题上有所涉入，在方法论上有何贡献。
- 在总结经验与贡献的同时，我们也分析问卷调查在高等教育研究中所面临的一些挑战，在方法论层面存在哪些问题。我们也针对这些问题提出相关建议和改进的方案。
- 在这一部分的最后，我们也针对问卷调查国际合作的可能提出一些设想。Adam Maltese博士也会在以下的报告中分享我们正在进行的一个STEM教育方面的跨国研究项目以及在这一过程中遇到的挑战。

Introduction

During the past two decades, scholars in China have increasingly recognized and used survey research methodology in the area of higher education. To better understand this research context, we investigate the characteristics of researchers' use of survey research methodology in higher education research, as well as reflect upon the impact of the methodology on policy making and implementation at the national, provincial and institutional levels. **We particularly focus on survey research that focuses on teaching and learning and students and faculty experiences**.

Research Questions

Drawing on data from published academic papers in the CNKI database (**中国知网)**, as well as national policy briefs and media coverage related to major Chinese survey research in higher education, we attempt to summarize and explain:

1) *the target population* of the surveys, as well as their *sampling techniques and rationales*;
2) the underlying *major themes and questions* that survey research have been contributing to in the area of higher education;
3) definitions and achievement of, and potential areas for improvement regarding, *survey validity and credibility*;
4) conclusions drawn from survey research projects, including the *social and policy implications* of the findings.

Themes and Content Areas of Survey Research

- Of the 29 papers we identified using survey methodologies, which represent research findings from 26 individual projects, we found 4 key themes:

1. Psychological state of college students
2. Language learning and distance learning
3. Graduate employment issues
4. College student opinions on current policies- especially those that are perceived to be most relevant to their lives

Themes and Content Areas of Survey Research, Continued

- *Psychological state/development of college students*:
  - Motivations and aspirations for and "habits" that challenge academic success (such as procrastination)
  - Psychological challenges: entrance examination and study pressure; suicide; low income students unique challenges
- *Teaching and learning*: distance education (attraction to students, areas of training best addressed on line) and students' learning outcomes and satisfaction

Themes and Content Areas of Survey Research, Continued

- Over 30% of the survey research papers in our data pool are designed to respond to and have potential to affect current social-educational issues and policies *at the national level* (loan policies, need-based tuition remission)
- Over 10% of the published papers focus on *institutional* and administrative reform (cafeteria renovation and the privatization of some university properties such as dormitories), with an emphasis on student opinion and satisfaction

Themes and Content Areas of Survey Research, Continued

- Student career development and employment, primarily voluntary on-line surveys of seniors across institutions and regions; questions include perceived influences on employment (family background, major, academic achievement, appearance)
- Most projects use mixed methodology research designs, and surveys in this category serve a significant function of giving systematic feedback on teaching.

Concerns and Suggestions

- Longitudinal research needed (students/employment)
- Frequent generalizations made from small “convenience” samples, hindering validity of statistical models being used. Qualitative approaches might sometimes be better.
- Research on second and third tier institutions lacking
- Add to age, grade & major the categories of SES, parental profession, geographic origin of student
- YET, ethical concerns particularly related to small samples where students can be identified: rural-urban disparity/income a sensitive topic
- Inadequate consideration of relationship between the researcher and the researched: IRB, surveys distributed and collected in classroom setting by instructors known to students—is rate of return (88-100%) worth it?
- Theory can dominate—ensure validity of survey construct and its correlation with question items
- The importance of pilot studies, largely missing in reviewed studies

Discussion and Reflections

- Throughout our review, we identified significant survey research projects on learner characteristics, attitudes and aptitude, and how these impact student learning outcomes. Less research has focused on *the processes of learning and interactions between teachers and learners*, which suggests the need for new approaches to research—and the importance of this conference
- Social constructivist theories are frequently employed in the theoretical frameworks for survey design.

Discussion and Reflections, Continued

- Different kinds of empirically-based validity tests are adopted, whereas credibility is defined in more diverse ways, based on the purposes of the survey research.
- Survey research, compared to other methodologies, seems to be relatively well funded at the national level
- Adaptations of internationally recognized surveys have increased during the past decade and seem to have had a positive impact on the development of survey research in China, as well as broadened and deepened capacity for institutional research at a number of institutions.

Discussion and Reflections, Continued

- Building upon existing learning theories and models is a characteristic of projects reviewed. Some were inspired by practical issues identified in the Chinese context; *most adapt* theoretical models developed in U.S., U.K., Germany
- Survey research in this category has potential to contribute to learning theories and practical global higher education by bringing to transnational research data from China. What does it mean for students to be “engaged,” for example, and how do institutions and teachers make that happen?
- Providing structures and opportunities for cross-cultural collaboration and data sharing is a key goal of AMISTEM project. Now Adam will share challenges of that process.

INDIANA UNIVERSITY

SCHOOL OF EDUCATION

II. Gaining Access: The Challenges of Collecting Survey Data
取得联系:收集问卷数据之挑战

Adam V. Maltese
Indiana University Bloomington

Background

- Many countries believe STEM is critical to improving economic status and quality of life
- Most international comparisons focused on STEM are assessments of pre-university students
- Our prior research strongly supports the importance of interest/engagement in academic/career plans
- Interest in determining how countries compare

Outline of Major Issues with Access

- Getting noticed
- Survey Fatigue
- Scheduling
- Ethics Review
- Building a sample
- Spam filters
- Collecting data
- Improving participation

Getting Noticed

- While it is easier to stay connected, it is also easy to be ignored
- Multi-method & multi-pronged approach
  - Attempt to make contact via mail, email & phone
  - Have multiple points of initial contact
- Fine line between getting a response and being a nuisance

Survey Fatigue

- Very easy to create & distribute surveys (online)
- Increase in use by institutional and academic researchers as well as for market research
- Students are a common target
- Institutions want to squeeze data from students while also protecting them
  - NAMI = Not At My Institution
  - Institutional Samples

Scheduling

- Beyond the “survey” calendar other times are off limits
  - Beginning and end of year
  - End of each semester – EXAMS
  - Holidays/breaks

- Ideal periods seem to be much of 1st semester and early in 2nd semester

Ethics Review

- Important to abide by all national, local and institutional regulations for human subjects research
- Range of ways schools handle ethics review:
  - No review
  - Want to see documentation of approval
  - Ask to complete data request
  - Require completion of local protocols & review

Building a Sample

- Need to be prepared for variation in preferences and practices
- We select a stratified random sample of schools > include specific departments > students & faculty voluntarily participate
- Some schools willing to share student/faculty contact data; others want to distribute themselves

Spam Filters

- Soliciting survey participants who do not expect to be solicited equates to SPAM
- Most institutions have measures in place where servers prevent high-volume emailing from hitting their students/faculty
- Possible to have email distribution servers “whitelisted” > low message rate
- SPAM rules = recipients need opportunity to opt out of future mailings

Collecting Data

- Different “norms” exist:
  - Contacts (e.g., text message, email)
  - Surveys (paper vs. online)
- Need to understand issues of access & potential bias
- Issues of data comparability

Improving Participation

- Improving response rate:
  - Personalized contacts
  - Multiple reminders
  - Incentives
- Incentive experiment in US and China
  - Gift cards (US: $0, $15, $30…..$60; China: RMB 40, RMB 80….RMB 160)
  - Minimal improvement between $0 and any incentive, no other substantive differences

Summary

- Make the study stand out to appropriate administrators & make clear to them how they might benefit
- Beyond initial approval, there are usually small steps that can delay/prevent getting the survey in front of potential participants
- Think deeply about tolerance for variation at each stage of process

总结

- 向相关负责人展示项目的亮点，同时让他们清楚认识到怎么能从参与项目中获益
- 在获得最初的许可之外，通常还有其他细节会导致从可能的参与者手中回收问卷的滞后/停滞
- 在过程的每个阶段要对可能发生的变动有充分的思想准备

Acknowledgments

- Heidi, Yimin and Lei
- Translation team
- Wang Jianlan
- Christina Melki & Heidi Wiebke

- IU FRSP – for funding this research

INDIANA UNIVERSITY

SCHOOL OF EDUCATION

III. Translation and Adaption of AMISTEM Instruments

AMISTEM 调查问卷中文版的翻译和修订

Lei Wang

Indiana University Bloomington

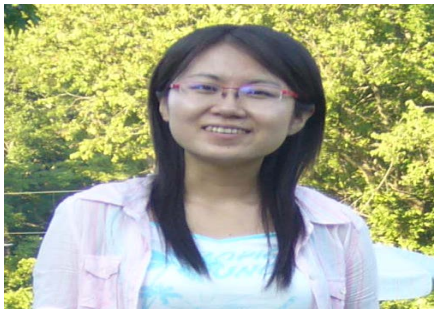
Before Translation: Two Rounds of Survey Editing

- Prior to translation and adaptation into Chinese, the English survey distributed to more than 8,000 students and faculty at American universities and colleges in 2012 and in spring 2013.
- Translation team edited and updated English language survey, based on feedback from respondents at American universities and colleges
- Three focus group discussions held on IU campus: student background diverse in terms of gender, majors, academic levels, nationalities, and ethnicities. Considering the length of the survey (180+ questions in total), the team divided the survey into three parts and each group focused on a different part.
- The team then made a second round of survey edits based on questions and concerns raised by those participants. Once these revisions were made, the team moved into the translation phase.

Team Translation Approach

- Adam Maltese: leader of the team and consultant
- Seven bilingual Chinese graduate students with diverse backgrounds.

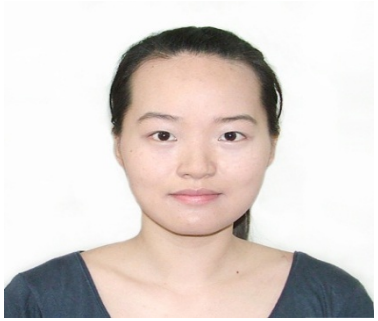
Wang Yimin 王一敏



Wang Hsiang-ning 王祥宁

Sang Wenjuan 桑文娟

Chen Wenya 陈文雅



Wang Lei 王蕾

Yin Xinying 殷新颖

Wang Jianlan 王荐斓

Team Translation Approach

- Two translators worked independently to produce two versions of the Chinese translation. By comparing the two versions, a third “reviewer” marked items on which the two translators largely disagreed with each other and on which the reviewer disagreed with both translators.
- The marked items were discussed by the whole team in order to produce the most accurate translation possible.
- Diversity of background of team members (even age) crucial in this stage.

Challenges of and Issues in Translation and Adaption

- Language-driven Adaption
- Socio-Cultural Adaption including:
  - Differences between U.S./China education
  - Social Structure of Chinese Society
  - Cultural Practices
  - Retaining Items for Multinational Comparison
  - Handling Sensitive Issues
- Revisions after the Pilot Survey

Language-driven Adaption

- STEM or Li Gong Ke (理工科)?
- The team decided to keep STEM in the Chinese version of the survey for two reasons. The first reason was to emphasize the four areas STEM represents: Science, Technology, Engineering and Mathematics. The second reason was that with increasing communication and cooperation between Chinese and American higher education institutions, the acronym is understood by some if not many Chinese undergraduate students and faculty.

Challenges of Socio-Cultural Adaption

1. Dealing with the differences between American and Chinese Higher Educational Systems

- **Professional Ranking System**

  "What is your primary occupation?"

  Lecturer vs. Assistant Professor

  Result from Chinese pilot survey: 6 respondents chose option of "assistant professor" and 18 respondents chose "lecturer"

- **Flexibility in Choice of Majors**

  "As an undergraduate how aware are/were you of the job market for employment related to the discipline of your **intended** major?"

  Intended→ Current

- **Teaching Style**

  Do you use quizzes or clickers to provide students with immediate feedback in class? → Deleted "clickers"

Challenges of Socio-Cultural Adaption, Continued

2. Adapted and added some questions to reflect the social structure of Chinese society

- **Deleted** question about race
- **Deleted** "secondary schooling"

" What was the population in the town/city where you lived for most or all of your high school/ secondary schooling?"

- **Kept** "You belong to which ethnicity? "
- **Added** "You belong to which administrative region?"

Challenges of Socio-Cultural Adaption, Continued

3. Translating Cultural Practices

"Who was most responsible for sparking your initial interest in STEM?"

"famous scientist or science personality"

translated to:

"science figures in television or other mass media"（电视等大众文化中的科学人物)

Challenges of Socio-Cultural Adaption, Continued

4. Keeping Items for Multinational Comparison--

Team purposely kept in survey some items for comparison even though they seemed somewhat unsuitable for the Chinese context. Furthermore, we wanted to capture trends related to increasing numbers of students receiving their educations in multiple countries.

- In which country were you born?
- Are you completing a Pre-Medical School program?
- Grade1-4, 5-8 and 9-12

Challenges of Socio-Cultural Adaption, Continued

5. Handling Sensitive Issues—optional questions

Which of the following best represents how you think of yourself?
(下列哪类性取向符合您认为的自己？)

Straight, that is, not gay or lesbian (不是男/女同性恋)
Gay / Lesbian (男/女同性恋)
Bisexual (双性恋)
Something else（其他）
I don‘t know the answer（我不知道）

Were both of your parents/guardians the same gender?
（您的父母或监护人是同一性别的吗？）

The answers from 104 respondents in three Chinese universities:

- Straight, that is, not gay or lesbian (不是男/女同性恋) 91
- Gay / Lesbian (男/女同性恋) 1
- Bisexual (双性恋) 7
- Something else（其他）3
- I don‘t know the answer（我不知道）2

Revisions after the Pilot Survey

- New member joined the translation team after the pilot survey, enriching the team's discussion and understanding of the art and science of translation with his skills and expertise:

To what extent do you agree with the statements:

- "You see yourself as a math person"
- "You see yourself as a science person".

"您认为您是数学达人"

"您认为您是科学达人"

Revisions after the Pilot Survey

Proportion of respondents in China and U.S. who chose "no" (strongly disagree and disagree) to below. We surmise that Chinese cultural norms privileging modesty may prompt respondents to give negative answers to the two statements, even if they indeed are math or science persons.

Statement	China	US
您认为您是数学达人	62%	34%
您认为您是科学达人	47%	28%

您擅长数学吗？ 您擅长科学吗？

Questions?

We will be presenting preliminary findings from the research study itself tomorrow at a plenary session.

Thank you!