

Retrospective Tracer Study: Investigation of the Barriers and Fluidity Transdisciplinary to Develop Curriculum for Higher Teacher Education

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ABSTRACT

Curriculum in higher education which prepare teacher candidates is considered as effort of engage in borderless transdisciplinary interaction to construct a collective and coherent understanding of disciplinary interconnectedness and interdependency, which will serve as the foundation for teaching, research, and engagement. Retrospective tracer study is methods for investigation to link the relationship and relevance of transdisciplinary which occurs at teachers' workplace with transdisciplinary curriculum at the almamater.

KEYWORDS

transdisciplinary curriculum, retrospective tracer study, integrated, higher education, preservice education.

ARTICLE HISTORY

Received 20 October 2017
Revised 20 November 2017
Accepted 20 December 2017

Introduction

Institution of higher learning have been under increased pressure in the last decade to provide our nation with teacher education graduates who have a solid academic background (Lauritzen & Jaeger, 1994). National commission, law about teacher, association of colleges which organize preservice education for teacher candidates support the presence of target that each teacher need a more solid academic for supporting their teaching careers (Law of Republic of Indonesia no 14 Year 2005). Department arrangement in the program of preservice education for teacher students is still colorized by foundation which giving emphasis more to the existence of each science field, there is expression "it is my expertise and that is your expertise".

In contrast, the public school reform agenda demands that students develop competences to solve problems in their life. Teachers considers that students in the complex and dynamic life. To face the life, each individual is not enough only depending on one expertise, one skill, and one discipline, able to

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develop the emulation and integration ability from various expertise to get intact and comprehensive outcomes. As shown by teacher's science in high school by using arts as sources to explain about change and movement of sun (Krug & Cohen-Evron, 2000). With other words, fast and complex globalization bring consequences to the education worlds, especially to the mindset which is not fragmented, but need intact and comprehensive mindset by involving many expertise and using the potentials of multiple intelligence (Gardner & Hatch, 1989; Pasiak, 2006). And also with rapid technological development, demand the human ability to respond rapidly to the information and varied knowledge. As the theoretical consequences, the integrated and constructivistic approach become choice as thinking foundation to develop the education program in order to develop dependable human resources (Hoy & Miskel, 2005). The integrated and constructivistic approach become the thinking foundation in reforming the curriculum of preservice education program for the teacher candidate at the institution of higher education.

Preservice teacher education curriculum can be developed by giving many integrated (Tanner & Tanner, 1980; Fogarty, 1997), self-directed, collaborative, and transdisciplinary learning experiences (Lauritzen dan Jaeger, 1994). Curriculum is developed by integrating several science disciplines by come intact and comprehensive curriculum. Sciences which are integrated including interdisciplinary sciences in a study field or science family, transdisciplinary from other sciences. Even also possible to integrate the supportive competency which giving emphasis to soft skills to give nurturing effect (Mukhadis & Ulfatin, 2015). Transdisciplinary is considered as appropriate to be selected in developing curriculum in preservice education program because relate and absorbs many information form field conditions. Problems in the transdisciplinary model curriculum, such as including theoretical and philosophical foundation, structural model, cross content of competence and science discipline, learning system and also the evaluation and recognition.

Retrospective Tracer Study

There are two different (contrary) approaches to develop curriculum in higher education especially at the preservice education program for teacher candidates, that is prospective and retrospective approach. Prospective approach is done by giving more emphasis to the internal resources. Potentials and strength and limited resources in internal of education institution become the foundation to develop the new curriculum suitable with the field needs. It is different with the second approach, retrospective approach with give more emphasis to the opportunities and challenges consideration out of real condition in field. In this article, it is presented the second approach implementation, to look more, absorb and analyze the field condition, then used as reference to solve relevant rpblems with innovation in the learning method (Lawlor, Kreuter, Sebert-Kuhlmann, & McBride, 2015) at higher education as preservice education program. It is assumed that the field condition absorption will be depicted in its needs and relevance with the occurring life and will occur life. Retrospective approach is done by tracing the graduates distribution (retrospective tracer study) from higher education to look and analyze the field needs and its relevance with curriculum they got during preservice education program at almamater before they become teacher.

Retrospective method design of tracer study begun by looking the impacts and then doing flash back to get the causes. Then to be done researching, including observation, looking, and absorption. Observation is process to observe to the alumni related to their profile today. The profile can be in the form of occupation field, suitability of job with department, suitability of career in work with the education level and expertise obtained from department. Then, looking, to look the relevance level of competence of the graduates at the working place. Looking step including the competence relevance obtained from lecture with the proficiency needed in work, relevance of personality development obtained in lecture with competence needed in work, relevance of science field and skill obtained from lecture with competence obtained in work, and relevance of work skill and societal life obtained from lecture with competence needed in work. After both steps, the final step is researching process, that is absorption. The step is step to absorb information relate with experiences with high value level. At absorption, the information absorption including experiences / expertise needed in work, experience acquisition strategy proposed to be integrated into curriculum of higher education.

Retrospective tracer study reported in this article done to alumni of the State University of Malang as institution of higher education which prepare teacher candidates. Respondents including 1.906 alumni of year 1991 to 2016 graduates. Data collection done with open questionnaire and interview by phone, whatsapp, facebook, and instagram. During initial conversation discussed about how teachers interpret the theoretical and philosophical position in their daily practices. Our mutual research interests are in democratic, integrated education, barriers and fluidity of curriculum disciplinary structures. Using Table 1 as a guide, the following outlines the retrospective tracer study to more toward transdisciplinary for curriculum design in institution of higher learning.

Table 1 Questions and possible approach toward transdisciplinary curriculum

Questions	Single Transdisciplinary \longleftrightarrow disciplinary	
Studying the main tasks of each teacher?	Each teacher only teaches one subject to a group of students with same materials.	Teacher teaches several subject with interrelated materials.
How teachers should select the learning sources?	Using sources that can be used for certain subject.	Several teachers used same learning media for different function.
Is there coordinator across subjects in school?	No coordinator. Each teacher has initiative to design learning unit case by case basis.	A coordinator is appointed. Some subjects are formed project learning with interrelated theme.
Is there school grand design which need multi expertise?	School mission to make each activity direct to separated subject.	School success is reflected at activity which is designed in grand design which contain mission to reach the school vision.
How the relevance of course and subject in campus with the main task as teacher in	Department subject in campus become the determinant of the	Success of teacher work is determined how they adapted / solved many different task

school?	work task in school.	flexibly in school.
How the participation of other parties in contributing toward learning strategy?	Each subject has permanent syllabus that contain structured content with scope which has determined suitable in formal curriculum without involving other parties.	Teacher develop learning model and strategy and syllabus by involving many parties including students, among teacher, societies and other experts.

With questions in table 1, researching process then done with results analysis. The analysis stage is the vital stage at retrospective tracer study because will get information and finding relevant with the transdisciplinary tendency occurred in real life in school. The analysis results then become input or material that can be used as consideration in the integration into curriculum of higher education as the preservice education program for teacher candidates.

Result and Discussion

Based on data from questionnaire and interview, then be analyzed with questions in table 1, higher education curriculum represents the characteristics of the university that are continuously influenced by external aspects (Hyun, Kretovics, & Crowe, 2006; Hyun, 2010). External aspect, in it including the transcultural global phenomena, laws history and citizenship, policies, demographic changes, technology, economy, natural disasters, the desires of public, the needs of the human community, etc. Exploration about external aspect refer to the real condition experienced by teacher in school, the interpretation can be classified suitable with the tendency at transdisciplinary or single disciplinary curriculum.

Transdisciplinary at school and subject level

It is known that 78,11% graduates of the State University of Malang become teacher in public school and private school (kindergarten up to senior high school) (Ulfatin & Mukhadis, 2017). School as their work place reflects school which follow the development of transcultural global phenomena. Globalization phenomenon can be seen at several schools shown by school visions which direct to the formation of proficiencies needed in the global competition. Learning in school not only learn about what is the subject content, but also how to implement the subject to solve bigger problems in the global competition. Kadir (2015) stated that learning framework based on global competence showed needed proficiency in global competition, that is English skill, communication through online technology, scientific publication, entrepreneurship, and marketing management. Competence to global competition should be mastered by all teacher.

School vision in general can be taken the continuum line which reflect two tendencies of school curriculum direction, that is curriculum model that give more emphasis to the separated curriculum suitable with the stimulation of government. The other, there is school which tend to show vision with integrated model and broad field curriculum. At modern private school, there is tendency to package school program through the second model, that is integrated curriculum. Integrated curriculum at the school vision is reflected at the many activities which is packaged in the form of "live in", "community service", the use of English in daily communication, and the student services that given more emphasis to the

multiple intelligence potentials. School model with tendency to the second vision which describe about the importance of transdisciplinary approach in school. To embody the school vision, teacher not bound to the one science discipline expertise which become the teaching task foundation, but in same time he also need other supporting and interrelated skills. Wulan (Ulfatin and Mukhadis, 2017) alumni who become Indonesian language teacher at a famous junior public school, she stated her experiences as follows:

... I have taught for 11 years, and included as senior teacher. Experiences and course I got in campus as student many not relevant and not sufficient to be implemented in school where I work. Although I am a language teacher, but I also handle management for student services. Each semester I am become manager and coordinate teacher activities packaged in project based learning. Because of that, I have to learn management, communication, information technology, culture, and etc. All of that I didn't get during as student because I only learn about language understanding. I participated in workshop, training, and learning to be independent, to get many competencies and integrated during as teacher.

Interview citation from Wulan showed how wide and complex the needed competencies as teacher to embody the school vision. Transdisciplinary not only limited as learning approaches and strategy, but integrative abilities to bring school in achieving its goals. The same thing shown by writer from previous research that each teacher (whatever the expertise field) he also have life skills (Ulfatin & Mukhadis, 2016). Life skills ability, including soft skills (leadership, personal skills), social skills (cooperation, communication), vocational skill, and academic skills is intact figure about transdisciplinary skill needed in real life in school

Transdisciplinary which shown by Wulan not only at school level. Suitable with its basic skill as language teacher, he also can be investigated through learning strategy and model he implement in class. Of course he wants the language learnt by the student can be implemented in many societal lives. Each learning has many goals. The goals reflect transdisciplinary unit in learning. To reach many goals, then need many strategies, many resources, many network, many skills, all of them interrelated, to form a system as the transdisciplinary approach in learning. As shown by Lauritzen and Jaeger (1994) a Drama teacher who teach the student to learn a story, in narrative content the story actually enters the human story, where in the life cannot be separated with other person then be explored by making understanding which show the experience of around world. Through story, he obtains experiences through questions, puzzles, and ideas. As a natural extension of interacting with the text, we want to know more about the characters, their motivations and action, and problems they encounter. Through narrative framework which is begun from history story of organizational structure, curriculum is determined not only at the context for learning, but also to describe the way to know it, and understanding about how we learn well up to discuss about problem solving experienced by the students. With description that transdisciplinary learning reflect that learning plan is made collaboratively between teacher and student with teaching team, oriented to problem and real life. At the heart of transdisciplinary learning is the education of the whole child. The framework not only outlines the knowledge and concepts to be taught over time, but it also addresses the skills and attitudes to be developed across all

subject disciplines. As this is achieved, learning and teaching transcend departmentalized areas as conceptual development is emphasized through the lens of language, math, science, social studies, and personal, social, physical education, and etc.

Development of transdisciplinary curriculum for higher teacher education

Through artificially divided academic department and their own individual department curriculum structure, universities continuously educate new generation and produce the workforce (Hyun, 2010). As a result, college graduates are knowledgeable in their own discipline, but in many cases, they are limited in understanding, applying, and connecting that disciplinary knowledge with other disciplinary knowledge in real life problem solving task. Hyun showed when they can speak to one another, but they do not have the language to communicate fully to understand the problem at hand in not only a reactive manner (“interventionist”) but also, more importantly, in a proactive and preventive fashion for sustainability. Globally, the demand is great for a new workforce whose members hold sophisticated disciplinary knowledge along with the ability to transgress disciplinary thinking and practice in real-life situation to advance humanity in a proactive manner.

Today, boundaries that separate disciplines are constantly shifting both (their discipline and communicate and share to the solution of problem), because of increasing specialization through internal differentiation within the discipline and because of the integration of disciplines, including the social sciences (e.g., from physics, biology, chemistry, psychology, law, management and education to science education, mathematics education, school counseling, educational management, environmental education). Hyun (2010) showed, occasionally migration and collaboration by faculty from different disciplines, which have taken place as interdisciplinary engagement in research activity, have changed the university’s traditional landscape of disciplines through the transformation of existing disciplines and the emergence of new ones (e.g., Asian American Studies).

The faculty members in this department, they work with other faculty members from different department in the College of Education and Human Development. One of member in Department of Educational Management, they work with person from the member in Department of Language, Department of science education, etc. Hyun (2010) said derived from the binary worldview, the gap between natural/technical sciences and the humanities/social sciences, has been the fundamental root of the fragmentation of the modern university’s departmental organization, curriculum, and disciplinary thinking as well as research methodology (both inquiry and research methods). As done by the author (member of Department of Educational Administration at State University of Malang) who did research to understand various teachership content, then in research methods which used tracer study cooperate with members of Department of Indonesian Language Education and Department of Engineering Education. As a result, it has brought a deep and critical continuation, and approaching the challenging and complex problem in contemporary society. Furthermore, Hyun say that specialization has been institutionalized through the higher education curriculum by excessive departmentalization. It allows an institution perceptual convenience that is manageable, easy to control, a clearer-

cut or linear conceptual framework for evaluation of the individual faculty members' performance for tenure and promotion, an easier attribution of resources, and straightforward professional and public recognition.

Lauritzen and Jaeger (1994) asserted that as teacher educators, we decided that if we wanted our students to be a different kind of teacher, they first had to be a different kind of learner. We believed that they couldn't promote the new goals of schooling if they had never experienced learning that was self-directed collaborative, and transdisciplinary. Although the concept of integrated curriculum is certainly not a new or revolutionary idea, immersing preservice teachers in a transdisciplinary learning adventure that they translate into a teaching adventure may be.

As stated, that to fulfill the global needs, then emergent problems of human society have become increasingly complex and interconnected and interdependent in nonlinear modes. These kinds of problems are neither confined to particular sectors or disciplines nor easily predictable. Human beings face nonlinear dynamics, uncertainties, and high geopolitical stakes in decision making coupled with ethical dilemmas and their complexity. Higher education institutions have a major role to play in preparing the kind of well-educated, critical, knowledgeable, and flexible workforce necessary to the contemporary and futuristic social, transnational, and transcultural endeavors in complex global human society. Higher education curriculum clearly reveals a need to transform beyond the single/monodisciplinary, toward transdisciplinary, borderless engagement (Hyun, 2010). Transdisciplinary is a principle for unity of knowledge beyond disciplines, and its approach implies full interaction, among, and beyond disciplines from a real-life problem-based perspective. Then, transdisciplinary as approach and paradigm can be passed through latently and evolutionarily. Transdisciplinary can be occurred slowly, from small investigation field slowly up to big approach, even become paradigm then done by many persons (Kolodinsky dkk., 2012). Transdisciplinary process can be explained from single disciplinary, multidisciplinary, interdisciplinary, and finally transdisciplinary. Single disciplinary aimed at understanding a topic of one science. Pohl et al. (2008) used term of "disciplinary silos", to mark that each department in higher education should has investigation focus, and each faculty should have program that mark the science field.

From single disciplinary, then develop become multidisciplinary. Multidisciplinary aimed at understanding topic with explanation of several sciences at same time. Wickson, Carew, & Russell (2006) said "multidisciplinary refers to faculty from different disciplines addressing a particular problem independently and staying within their specific disciplinary framework". While, interdisciplinary, aimed at transferring method from one science to others. Interdisciplinary is used to produce new science, combine several sciences together to make concept, method, and the application. After multi and interdisciplinary then can be used to explain transdisciplinary. Transdisciplinary aimed at uniting knowledge from several sciences with emphasis that it need many knowledge to solve the complex social problem. Because of that its influence to the fusion or/ integration of several knowledge to form new knowledge (Ulfatin, 2016b). Wickson, Carew, & Russell (2006) stated that "Transdisciplinary extends beyond a linear application of a static methodology and aims for an evolving, dynamic or responsive methodology that is iterative and an ongoing part of the

research process". Transdisciplinary approach can be used when knowledge about societies entirely relevant with field problem that full of uncertainty. At the societal problem, there are conflict, and in its many parties have string will to solve the problems. With other world, transdisciplinary needed to solve complex societal problems. To this end a curriculum with a transdisciplinary orientation demands a politics of academic civility in the context of discourse among faculty from varous disciplines (Hyun, 2010).

As approach to reform curriculum, transdisciplinary curriculum experience is about learning, inquiring, researching, realizing, and articulating real life-based problems to solve in a transgressive manner (Hyun, 2010; Ulfatin, 2016a). In learning, several subjects (courses) are united become new theme, united through fusion curriculum and curriculum transformation. In learning, teaching, and research, those who understand and value transdisciplinary and have been successfully involved in transdisciplinary engagements: (a) grasp the complexity of problems and phenomena, (b) take into account the diversity of scientific and societal views of problems and phenomena, (c) link abstract and real life, and (d) constitute knowledge with a focus on problem solving for what is perceived to be common good (Hyun, 2010). By infusing transdisciplinary research approaches into the teaching and learning process, transdisciplinary curriculum in higher education will bring opportunities to realize and illustrate humankind collectively promoting social progress in borderless human engagement and to expose and overlap the awareness and ability of each learner to question critically what is in light of what might be.

Real work about transdisciplinary curriculum development for higher teacher education can be shown by work of Kolodinsky et al. (2012) which begun the program with minor system ("A food systems minor") in University of Vermont. From small scale (minor) become grand-university, Kolondinsky showed their steps successively, that is from (1) "The Honors College picks food systems"; continued with (2) "A faculty-led, student-run seminar expands food systems thinking and activities"; (3) "Student initiatives parallel faculty action: Student voices"; (4) "The Real Food Challenge opportunity" (in its is done demonstration, exhibition, and etc_; and ended with (5) "Other initiatives provide an opportunity to engage more students". It is concluded that transdisciplinary program that cross traditional university structure lead to uncharted territory. For every successful effort, a barrier appears, but nevertheless there is progress. Sharing University of Vermont's approach and journey toward a holistic, integrated approach to food systems will be helpful to other institutions as they build their programs for learned transdisciplinary approaches.

Conclusion

Preservice program of teacher education at institution of higher education can be developed by giving many integrated experiences, self-directed, collaborative, and transdisciplinary learning. Curriculum is developed to transdisciplinary direction by integrating many expertise, many experiences, and many persons that give emphasis to opportunities and challenge consideration in the real condition in field. Retrospective approach is used to look, absorb, and analyze the real condition in field, and make it as reference to arrange curriculum in higher education which prepare preservice education program for teacher candidates. The real condition absorption is depicted at the work profile of teacher

and their competence relevance with the real life in school.

Exploration about external aspect showed to the real condition experienced by teacher in school, which the interpretation can be classified according to the tendency to the transdisciplinary or single disciplinary curriculum. Transdisciplinary aimed at uniting the knowledge from several sciences by emphasis to many knowledge to solve the complex social problem. Because of that, influence the fusion and/ or integration of several knowledge to form new knowledge.

Development experience of transdisciplinary curriculum in higher education for the teacher candidates can be packaged and designed by involving individuals, department, and faculty through team teaching, small and grand teaching. As approach to reform transdisciplinary experience curriculum is about learning, inquiring, researching, realizing, and articulating real life-based problems to solve in a transgressive manner.

Disclosure statement

No potential conflict of interest was reported by the authors.

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