



Further Training Needs for TVET Trainers: Lessons from a National Survey on Rwandan TVET Trainers' Instructional Competencies

Woocheol Kim¹, Heh Youn Shin^{2*}, Hejung Woo¹ & Jiyoung Kim¹

¹ Department of HRD, Korea University of Technology and Education, 1600 Chungjeol-ro, Byeongcheon-myeon, Dongnam-gu, Cheonan, 31253, SOUTH KOREA

² Lifelong Learning and Adult Education Program, Pennsylvania State University, 314 Keller Building, University Park, PA 16802, USA

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Abstract: Recently the Republic of Rwanda has expanded the national TVET system in response to the country's growing need for a skilled youth population. However, policymakers have generally overlooked that the quality of the TVET system as a whole largely depends on the quality of TVET trainers. Recognising this lack, we conducted a national survey on TVET trainer's instructional competencies to gather information about the current status of TVET trainers' teaching quality. Additionally, after operating a pilot training program for TVET trainers at the RTTI, the national training institution for TVET trainers, we executed the same survey to the training participants to examine their instructional competencies. Then we compared its results in comparison to the results attained from the national survey. All assessments were done by measuring TVET trainers' and students' perceptions of TVET trainers' teaching behaviors. This research represents the first efforts to understand the current level of TVET trainers' teaching skills in Rwanda. Also, the survey results of the teaching behaviors of TVET trainers who received the training indicated the positive effect of the training. Implications of this research at the individual (trainers), institutional, and national levels are discussed at the end.

Keywords: Technical and vocational education and training (TVET), training-of-trainers (ToT), instructional skills, teaching behaviors, Republic of Rwanda

1. Introduction

Cultivating workforce with skills and knowledge as demanded by the labor market is important for individuals to increase their employability, for employers to reduce skills gap, and for countries to stay competitive in today's globalised economy. As a response, both advanced and developing countries have begun to pay more attention to bolstering their Technical and Vocational Education and Training (TVET) systems. International organisations also have been calling for increasing the investment in TVET as a part of national development agenda for developing countries in efforts to fight against poverty and increase national productivity (see ADB, 2009; ILO, 2015; UNESCO, 2016).

The government of the Republic of Rwanda (hereafter Rwanda), along with other African countries, joined the movement of strengthening its TVET system; it adopted revised TVET policies in 2008 to improve the quality and relevance of TVET in developing a skilled workforce who can contribute to national development (Ministry of Education [MOE], 2008, 2015b). The Ministry of Education stated that the reformed TVET system, grounded in the human capital approach, aims to "provide the economy with qualified and competitive workers and to train citizens able to participate in sustainable growth and poverty reduction by ensuring training opportunities to all social groups without discrimination" (MOE, 2008:2). Over the recent decade, the government expanded the number of TVET schools and facilities to prepare the youth population better to meet the demands of the workplaces. Thanks to the greater accessibility of the TVET

*Corresponding author: hms5459@psu.edu

system, the number of enrolled students has been steadily increasing to date, thus bridging the skills gap in the labor market. Between 2010 and 2014, the number of TVET schools across the country increased from 60 to 345 (Prime Minister's Office, 2014), and as of 2015, about 40% of all students in upper-secondary education were enrolled in TVET programs (Integrated Polytechnic Regional Centre [IPRC], 2015).

Despite the increased recognition of the TVET system in Rwanda, the current TVET discussion tends to center on increasing the number of enrolled students and institutions, with relatively less attention given to the issue enhancing the quality of education, in which training quality TVET trainers should be preceded. A lack of interest in the issue of cultivating quality TVET trainers is not a problem limited to Rwanda. Because TVET is still underrepresented in many countries (Ismail et al., 2018; UNESCO, 2011; Yu, 2009), systematic paths for in-service TVET trainers to become competent teachers and further develop their teaching skills are often lacking (ILO, 2015). Given the limited investment for their professional development, TVET trainers are often situated to use outdated or irrelevant teaching materials and skills that will not necessarily transfer into students' adequate skills development (Johnson & van Adams, 2004).

Thus, training TVET trainers, also called as Training-of-Trainers (ToT), is an important aspect of running successful TVET courses and achieving students' intended educational outcomes (Ismail et al., 2018; Woo, Kim, Yi, & Yoon, 2018; Yu, 2009). Training TVET trainers also motivates them to develop professional identities, understand changing contexts in TVET, improve their instructional skills, and design adequate learning environments for their students (Grootings & Nielson, 2005; Grollmann, 2008; UNESCO, 2014). Although the Rwandan government saw that most of the TVET trainers were performing inadequately due to their lack of practical technical competencies, instructional preparation, and teaching motivation (MOE, 2008), there has not been a system in place for monitoring current TVET trainers' teaching performances to date.

In this regard, from the perspective that students' effective learning starts from teachers' effective teaching, our research seeks to examine the current levels of in-service TVET trainers' instruction skills to provide the background information to improve the Rwandan TVET system. Also, we assess the instructional skills of those who participated in the pilot ToT program, which was carried out for a selective number of TVET trainers at the IPRC, the newly established training institute for TVET trainers by the Rwandan government, as a part of the newly organised TVET Qualification Framework. The research outcome provides useful background information for identifying the strengths and weaknesses of TVET trainers' current instructional competencies, implementing the monitoring and evaluation plan of their instructional competencies, and developing the ToT curricula for them. Our research outcome not only contributes to promoting a quality TVET system in Rwanda, but extends to other countries, both within and outside Africa, in developing their ToT programs with an emphasis on instructional skills.

This research consists of two phases of studies: Study 1 aims to assess TVET trainers' teaching behaviors at the national level, and Study 2 intends to assess teaching behaviors of the TVET trainers who participated in the ToT program. TVET trainers' teaching behaviors were assessed by measuring TVET trainers' and students' perceptions. Thus, in both studies, all assessments were executed by two groups, including TVET trainers and students. The following research questions guide this research:

Study 1: How do TVET trainers and students across Rwanda perceive their own and their teachers' current teaching behaviors?

Study 2: How do TVET trainers who participated in the Training-of-Trainers (ToT) program and their students perceive their own and their teachers' teaching behaviors?

2. Related Works

Rwanda suffered the impact of a tragic war and genocide in 1994, which resulted in the loss of about one-eighth of the total population in the country and threatened Rwanda's national stability and economy (Korea University of Technology and Education [KOREATECH], 2016; Musobo & Gaga, 2012). Since then, Rwanda has been committed to economic and structural reforms. The recent national agendas include "Rwanda Vision 2020" and "Economic Development and Poverty Reduction Strategy II," both of which seek to transform the country from a low-income agricultural economy to a knowledge-based economy with a middle-income country status by the year 2020 (MOE, 2008). The key to the above policies is restructuring the TVET system and training individuals with skills and knowledge suitable to workplace demands (MOE, 2008).

The percentage of the population that enrolled in the TVET system between 2013-14 was 2.46% (National Institute of Statistics of Rwanda [NISR], 2016a). Among students aged 14 or older, Kigali, the capital, had the highest percentage of participants (4.26%), followed by the northern and eastern provinces (2.32%), and the southern and western provinces (2.03%; NISR, 2016a). Whereas the employment and economic activity participation rate of people 14 to 35 years old was about 76% in 2016 (NISR, 2016b), a considerable number of them enter the labor market after receiving brief educations that leave them with insufficient technical skills and knowledge (MOE, 2008). Also, the low relevancy and applicability of TVET programs to the workplaces are causing the low employability of graduates, worsening their unemployment rate and the skill mismatch challenge in the labor market (Musobo & Gaga, 2012).

The TVET system is embedded in the general education system in Rwanda. It comprises of three levels: vocational, technical, and polytechnic. The first vocational level, offered to students enrolled in basic education, provides the knowledge and skills needed to enter the labor market. This level of training is provided at Vocational Technical Centers (VTCs), which involve both public and private institutions. The second level of training, technical training is mainly for

upper-secondary students, and it is provided at Technical Secondary Schools (TSSes) in both public and private sectors. The third level, which takes place at polytechnics (or Colleges of Technology [COTs]), allows graduates from upper-secondary schools to receive advanced technical training equivalent to diplomas and advanced diplomas. There are also Integrated Polytechnic Regional Centers (IRPC), which integrate these three levels of TVET. IRPCs are located in Kigali and the other four provinces (MOE, 2008).

With the Rwandan governments' recent efforts in strengthening its TVET system (MOE, 2015b), the number of TVET trainers has increased over the years: there were 318 trainers in 2013; 716 in 2014; 1207 in 2015; 1897 in 2016; and 2759 in 2017 (MOE, 2013). The budget allocated for training both pre-service and in-service TVET trainers has also increased consistently from 2013 to 2017 (MOE, 2013). However, due to the increase in number of students enrolled in the TVET system during the same period (MOE, 2015a), the demands for skilled and motivated TVET trainers has been growing as well. Recognising the need for qualified and competent TVET trainers, the government established the Rwanda TVET Trainer Institute (RTTI) in 2017, supported by the South Korean government (KOREATECH, 2016).

The RTTI provides ToT programs that encompass instructional skills and job-specific technical skills. Participating trainers come from all levels of the TVET institutions, including the COTs, TSSes, and VTCs located across the country (MOE, 2015a). Beyond providing ToT programs, the RTTI also issues the national certification for TVET trainers and cultivates competent facilitators who can instruct ToT programs (KOREATECH, 2016). The pilot operation of the ToT program at the RTTI was made in 2016, which informs the second part of our research.

Among the various learning modules, in this research, we chose to focus on those related to instructional skills that contribute to improving teaching behaviors. The literature supports that improvement of teachers (or trainers)' instructional skills plays a critical role in promoting their teaching behaviors that help students (or trainees) learn skills being taught (e.g., Estriyanto, Kersten, Pardjono, & Sofyan, 2017; Gronlund & Linn, 1990; Ismail et al., 2018; Reiser & Dick, 1996; Yu, 2009). Within the RTTI's training program, learning modules that are primarily designed to develop trainers' instructional skills consist of four areas: needs assessment, program development, instructional design and planning, and classroom application of education evaluation.

The training objective and content of each module in the training program is as follows (RTTI, 2016a, 2016b, 2016c, 2016d). The first module, training needs assessment, aims to strengthen TVET trainers' competency in recognising the importance of training needs analysis, identifying the different types of needs analyses, applying methods of collecting information for needs assessment, and developing training delivery plans using various ways of implementation. In the second module, training program development, the goals are to identify the components of training program development, plan the phases of training program development, select training objectives based on the results of training analyses, establish the teaching and learning environment of the training program, and evaluate the program development phases and the training program as a whole. The goal of the third module, instructional design and planning, is to understand effective instruction, identify instructional goals and specific objectives derived from these goals, plan instructional activities, use instructional media, and develop and implement assessment tools. Lastly, in the classroom application of education evaluation module, trainers learn to explain different terms related to evaluation, recognise the three levels of evaluation, understand the types of evaluation in teaching and learning, and develop testing items for the process and products in vocational training.

The ToT program was implemented for eight weeks, from 17 July 2016 to 2 September 2016, at the RTTI within the IPRC located in Kigali. For completion of the training program, the TVET trainers were required to complete 18 modules of which 4 modules particularly related to developing instructional skills aforementioned. Six facilitators were selected among the experienced TVET trainers who were accredited by the national TVET Trainer Qualification Framework (TTQF). They paired up to operate the training sessions and thereby transferred their seasoned skills and knowledge. In every module, the facilitators evaluated trainers' achievement using written and oral assessments. These assessments were monitored by the Workforce Development Authority (WDA) under the Ministry of Education.

3. Method

This research consists of two sub-studies: Study 1 aimed at assessing how TVET trainers and students perceive their own and teachers' current teaching behaviors at the national level. Study 2, focusing on the pilot ToT program operated at the RTTI, intended to assess how the ToT participants and their students perceive about their own and teachers' teaching behaviors. In both Study 1 and Study 2, TVET trainers and students from all three levels of institutions (i.e., VTCs, TSSes, and COTs) took part in the surveys. Both sub-studies were conducted as a part of the official development assistance (ODA) project implemented by the KOICA with its special partnership with the Rwandan government.

In Study 1, a total of 4,721 TVET trainers and 94,343 students across Rwanda made up the optimal number of participants with a 95% confidence level (Krueger, 2001). The minimum estimated sample size of TVET trainers was 354, and that of TVET students was 384. A self-reported survey, using the 5-point Likert scale, with an English version of the questionnaires was utilised since English was the medium of instruction in the ToT program. The surveys were distributed from March to June 2016 with the support of the WDA and the Korea International Cooperation Agency (KOICA). A total of 1106 TVET trainers and 1261 students took part in Study 1.

Study 2 focused on assessing the teaching behaviors of the TVET trainers in the pilot ToT program, as perceived by themselves and their students. The surveys were implemented approximately two months after the completion of the training program. All 49 TVET trainers in the ToT program participated in the survey. The minimum sample size for the

students was estimated to be 384 students, which was the same as that of the national survey for students in Study 1, in order to make the survey comprehensive and representative. The questionnaires used in Study 1 and Study 2 were identical for both TVET trainers and students. The Study 2 surveys were distributed in October 2016 with the support of the WDA and the KOICA. A total of 49 TVET trainers and 557 students participated in these surveys.

3.1 Survey Design and Measurements

A total of six educational and training experts (two from the KOREATECH, two from the WDA, and two from the IPRC-Kigali) participated in developing and reviewing the survey questionnaires, both for the trainers and the students. First, the two experts from the KOREATECH, who was responsible for designing the learning modules of the training program, developed the questionnaires, and each questionnaire item related to the specific learning goal of each training module. The initial questionnaires were developed in Korean and were translated into English with the help of the expert from the KOICA. The local experts from the WDA and the IPRC-Kigali reviewed the translated questionnaires to ensure they are readable and fit into the local TVET contexts. Before conducting the nationwide surveys, the finalised survey questionnaires were pilot tested to 9 TVET trainers at the IPRC-Kigali and their 10 students to remove any response bias and wording concerns and thus enhance the reliability of the survey.

The 5-point Likert scale was used in the survey questionnaires, asking the respondents to rate their perceived frequency of the teaching behaviors of the TVET trainers, using the anchors ranging from 1 (Never) to 5 (A great deal). The survey team composed of six experts from KOREATECH, IPRCs (Kigali and regional offices), and WDA conducted the paper surveys by visiting the training institutions.

The survey questionnaires for the trainers consisted of 27 questions across four sub-sections (i.e., training needs assessment [7], training program development [5], instructional design and planning [8], and classroom application of educational evaluation [7]). Each item on the questionnaires reflected the learning goals of the four modules covering instructional skills in the training program. The survey questionnaires for students were developed based on the survey for TVET trainers. The students' survey questionnaires consisted of 22 questions across the same four sub-sections, aligning with that of the trainers' survey (i.e., training needs assessment [5], training program development [5], instructional design and planning [6], and classroom application of educational evaluation [6]).

3.2 Data Analysis

Study 1 aimed to assess the current teaching behaviors of TVET trainers across Rwanda. Study 2 was conducted to the TVET trainers who completed the pilot ToT program and their students. The purpose of our data analysis was to examine whether teaching behaviors of TVET trainers who took part in the training program are different from those of the national-level survey to evaluate the effects of the pilot training program. Thus, we employed one sample t-test because it enabled us to examine whether means of each survey items on teaching behaviors of TVET trainers who completed the pilot training program are significantly different compared to those from the national level. In addition to statistical significance tests, we conducted practical significance tests by calculating the effect size with Cohen's *d* and interpreting its coefficient based on the descriptors (i.e., 0.20 as a small effect size; 0.50 as a medium effect size; and 0.80 as a large effect size; Kotrlik & Williams, 2003).

4. Results

In Study 1, a total of 1,106 in-service TVET trainers and 1,261 students from three levels of institutions across the five provinces (i.e., Kigali, North, South, East, and West) participated in the survey; respectively, 266 trainers from Kigali, 219 trainers from North, 204 trainers from South, 207 trainers from East, and 210 trainers from West participated in the survey. There were 302 students from Kigali, 233 students from North, 249 students from South, 237 students from East, and 240 students from West.

Study 2 was informed by the pilot training program that was executed for 49 TVET trainers and their students. Regarding the trainers, 14 were from Kigali, 5 from North, 9 from South, 16 from East, and 5 from West. The survey for students was conducted two months after the completion of the ToT program. A total of 557 students – 60 from Kigali, 133 from North, 142 from South, 90 from East, and 132 from West – participated in this survey. A snapshot of the participants' demographics is provided in Table 1.

Table 1 – Total Number of Participants

Purpose	Province of Rwanda	Participants	
		Trainers	Students
Survey for the national level	Kigali	266	302
	North	219	233
	South	204	249
	East	207	237
	West	210	240
	Total	1,106	1,261
Survey for the pilot training program	Kigali	14	60
	North	5	133
	South	9	142
	East	16	90
	West	5	132
	Total	49	557

4.1 Study 1: Teaching Behaviors of TVET Trainers at the National Level

The survey for TVET trainers is composed of four sections. The detailed survey questions for each section, as well as participants' self-rated scores of their teaching behaviors, are illustrated in Table 2. Seven survey questions were used to measure TVET trainers' training needs assessment behaviors. TVET trainers perceived trainers' training needs assessment behaviors ranged between 3.26 (T1) and 3.72 (T6) out of 5. The TVET trainers' behaviors to develop a training program, measured by five survey questions, scored from 3.26 (T8) to 3.68 (T12). Next, TVET trainers' behaviors related to instructional design and planning, measured by eight questions that varied between 2.89 (T17) and 4.08(T20). Lastly, TVET trainers' behaviors related to classroom application of educational evaluation are measured by seven questions, and they scored between 3.67 (T25) and 3.93 (Y24).

Table 2 - TVET Trainers' Self-perceived Teaching Behaviors at the Rwanda National Level

Section	Survey Question	N	Mean	SD
Training Needs Assessment	T1. How often do you assess training needs as you develop and/or update training program (training course) per year?	1,093	3.26	1.159
	T2. What is the level of your compliance with the procedure of the training needs assessment?	1,090	3.40	1.047
	T3. How much does the training needs assessment affect your training program?	1,081	3.46	1.149
	T4. How detailed is your performance analysis on the jobs in your field of specialisation?	1,074	3.38	1.103
	T5. How confident are you in conducting interviews for your needs assessment?	1,063	3.69	1.022
	T6. How confident are you in developing a questionnaire for your needs assessment?	1,060	3.72	1.026
	T7. How much do the results of your needs assessment affect your training plan and contents?	1,062	3.47	1.040

Table 2 - TVET Trainers' Self-perceived Teaching Behaviors at the Rwanda National Level (Cont.)

Training Program Development	T8. How systematic is your training program development?	1,098	3.35	1.003
	T9. What is the level of consistency between the training objectives and the task goals of jobs in your trade?	1,089	3.55	0.983
	T10. What is the level of consistency between the lesson objectives and the contents of trainee performance evaluation?	1,085	3.64	0.940
	T11. How systematic is your development process for teaching and learning material?	1,070	3.59	0.947
	T12. How well are the functions of your training center prepared to support the newly developed training program (training course)?	1,076	3.37	1.092
Instructional Design & Planning	T13. What is the level of your teaching competency?	1,099	3.92	0.851
	T14. How often do you use the teaching methods for improving creativity, problem-solving, etc. in your class?	1,080	3.86	0.876
	T15. When do you teach something in your class, how often do you identify prior and prerequisite knowledge and skills?	1,079	3.80	0.916
	T16. How often do you use the rubric or/and checklist for the skill competency in your class?	1,064	3.52	1.012
	T17. How well do you use educational media in your class?	1,089	2.89	1.265
	T18. When you teach some technical skills, do you select the proper teaching skills?	1,082	3.84	0.980
	T19. When you encounter problems in motivating your students, can you select the proper motivational skills?	1,088	3.82	0.947
	T20. Before you start your class, how confident are you in making a plan of instruction and learning activities?	1,094	4.08	0.897
Classroom Applications of Educational Evaluation	T21. What is the level of developing the test items for measuring knowledge and skills?	1,094	3.78	0.881
	T22. How well do you understand basic concepts relating to assessment or evaluation?	1,085	3.83	0.921
	T23. How confident are you in developing test items for knowledge?	1,088	3.90	0.891
	T24. How confident are you in developing test items for skills?	1,087	3.93	0.917
	T25. When you develop test items, how much do you consider the validity and objectivity of them?	1,095	3.67	0.898
	T26. When you teach some new skills, how confident are you in developing rubric or checklist for measuring them?	1,094	3.77	0.928
	T27. When you teach some new knowledge in your class, how adequate are the testing tools (multiple choice test or essay test) you developed?	1,091	3.71	0.913

The second part of Study 1 was conducted to TVET students at the national level, asking them to assess how they perceived about TVET trainers' teaching behaviors. Five survey questions under the training needs assessment asked students to measure how much TVET trainers responded to their learning needs in the classroom. The scores ranged between 3.13 (S1) and 4.08 (S2) out of five questions. Regarding five questions regarding how students perceived their trainers' efforts to develop a training program, the scores were located between 3.33 (S6) to 4.12 (S9). Next, the trainers' instructional design and planning behaviors were measured between 3.17 (S16) and 3.53 (S13). The scores of the last six questions on the trainers' behaviors to evaluate the training course or program they implemented ranged between 3.23 (S21) and 3.43 (S20). Table 3 presents a detailed look at the survey results for students.

Table 3 - Students' Perceptions of TVET Trainers' Teaching Behaviors at the Nationwide Level

Section	Survey Question	N	Mean	SD
Training Needs Assessment	S1. How well do your needs for skills and knowledge appear fully and orderly in this curriculum?	1,229	3.13	1.133
	S2. How much do you think the successful completion of the program would improve your skills and knowledge?	1,232	4.08	1.053
	S3. Do you think that the contents of the training you learned are updated to reflect the current work procedures and tools in the related company?	1,241	3.49	1.250
	S4. How well do you think the various characteristics of the tasks of the job in the company were considered in the program?	1,232	3.23	1.176
	S5. How well do you think the needs and learning characteristics of the trainees were considered in the program?	1,237	3.16	1.150
Training Program Development	S6. Do you think the training topics you learned were organised for helping you to learn each task successfully?	1,248	3.33	1.190
	S7. Do you think that you can do a task in a company as you complete each training objective of your program?	1,245	3.74	1.195
	S8. Does your learning environment need improvement that would help you to perform better in the training program?	1,234	4.06	1.087
	S9. How well do you think the learning materials were organised?	1,212	4.12	1.097
	S10. Does this training program need any improvement that would help trainees to perform better as they complete the training program?	1,229	3.92	1.161
Instructional Design & Planning	S11. How well did the trainer show content mastery and knowledge of materials?	1,228	3.41	1.145
	S12. How well did the trainer use example and analogies to enhance learning and maintain interest?	1,232	3.47	1.162
	S13. How well did the trainer motivate trainees (i.e., show enthusiasm, encourage participation, demonstrate respect, etc.)?	1,224	3.53	1.248
	S14. How well did the trainer question trainees to stimulate discussion and verify learning?	1,238	3.43	1.122
	S15. How well did the trainer use various teaching materials and explain those materials for the concepts, or theories, and skills?	984	3.39	1.191
	S16. Overall rating on the trainer's teaching methods	1,216	3.17	1.093
Classroom Applications of Educational Evaluation	S17. Did the trainer make mid or final tests that reflect the learning objectives?	1,197	3.26	1.216
	S18. Did the trainer evaluate the knowledge that you learned in class properly?	1,185	3.38	1.214
	S19. Did the trainer evaluate the skills that you learned in your class properly?	1,178	3.38	1.185
	S20. Did the trainer perform the question and feedback activities properly in the class?	1,223	3.43	1.204
	S21. Did the trainer evaluate trainees' skill competency objectively?	1,209	3.23	1.211
	S22. Overall rating on the trainer's evaluation competency.	1,230	3.24	1.215

4.1 Study 2: Teaching Behaviors of TVET Trainers in The Training Program and Their Comparison to The National Level Survey Results

In Study 2, the impact of the ToT program was analysed using one sample t-tests. The effect size was calculated using Cohen's *d*, thereby allowing a better understanding of the practical significance of the test results. The ToT participants assessed their teaching behaviors after training relatively higher compared to the results attained from the national level survey. By sub-sections, for the training needs assessment questions, the t-test results were statistically significant at the 0.01 level or the 0.001 level except for one question (T6). The Cohen's effect size values ranged from 0.38 (small to medium effect) to 0.5 (medium effect), which indicated the practical significance of the mean differences of the questions.

In the training development section, the t-test results of all five questions were statistically significant. Also, Cohen's effect size values were observed ranging from 0.24 (small to medium effect) to 0.7 (medium to large effect). Regarding the TVET trainers' behaviors related to instructional design and planning, the participants rated their behaviors higher than what was found in the national study. The test results for all eight questions were statistically significant at the 0.001 level except one question (T13). For these questions, the Cohen's effect size values ranged from 0.43 (small to medium effect) to 0.73 (medium to large effect). However, when asked about levels of teaching competency (T13), there was no statistically significant mean difference between the two surveys.

Lastly, for all questions related to classroom application of educational, the t-test results were statistically significant at the 0.01 level. The Cohen's effect size values indicated the practical significance of the mean differences, with values ranging from 0.39 (small to medium effect) to 0.66 (medium to large effect). Overall, as Table 4 indicates, the ToT participants showed higher levels of engagement in various teaching behaviors when compared to national survey results.

Another part of Study 2 is students' evaluation of their TVET trainers' original and newly adopted teaching behaviors. As earlier, the impact of the training program was analysed using one sample t-tests. The effect size was calculated using Cohen's *d* to determine the practical significance of the test results. Except for two survey questions (S2 and S9), the students gave higher scores to the teaching behaviors of the trainers who had participated in the training program compared to students from the nationwide survey. For the rest of the questions, the t-test results were statistically significant at the 0.05 level or higher 0.001 level. Also, various Cohen's effect size values were observed, ranging from 0.11 (less than small effect) to 0.59 (medium to large effect).

In questions S2 and S9, which focused on the expected outcomes of the training program and trainers' preparedness with learning materials, students gave lower scores to the trainers who had received the training compared to the scores students gave in the national level survey. The t-test results for the two questions showed statistically significant mean differences between the two surveys. In these questions, the Cohen's effect size values were 0.11 (less than small effect) and 0.70 (medium to large effect) in the negative direction, respectively.

As illustrated in Table 5, students showed more positive perceptions of the teaching behaviors of the trainers who participated in the training compared to the students' perceptions shown in the nationwide survey. This result indicates that both TVET trainers themselves and their students perceive their enhanced teaching behaviors after participating in the training program.

5. Discussion

Despite efforts to strengthen the national TVET system in Rwanda, there has been the absence of the monitoring and evaluation system to improve TVET trainers' teaching quality to date. The overall level of TVET trainers' instructional competencies has remained unknown. Also, although cultivating both content knowledge and instructional strategies are critical for developing TVET trainers' teaching competencies, the traditional training programs for trainers tend to focus on developing content knowledge and assess how much training participants internalised the teaching knowledge as the training outcome. Thus, how much they incorporate the learned knowledge and skills in actual teaching after the training have received little attention.

In response, focusing on TVET trainers' instructional skills as a foundation of quality teaching, our study sought to understand TVET trainers' current teaching behaviors by assessing TVET trainers' and students' perceptions. After the completion of the ToT program, which focused on developing TVET trainers' instructional competencies, as the Study 2 results indicate, overall scores of teaching behaviors for TVET trainers who were in the ToT program were higher than those found in the national surveys, in both TVET trainer and student groups, except for several questionnaire items. Thus the research results generally corroborate the importance of expanding ToT programs at larger scales so that a larger number of TVET trainers can have opportunities to develop professional instructional skills further. Our research results also support the findings from earlier studies that stress the relationship between training program for TVET trainers and their professional teaching competencies (e.g., Estriyanto et al., 2017; Ismail et al., 2018; Paleocrassas, Tsiantis, & Dimitropoulos, 2009).

Table 4 - TVET Trainers' Self-perceived Teaching Behaviors in the ToT

Section	Survey Question	N	Mean	SD	Mean Difference	t	Cohen's d
Training Needs Assessment	T1	49	3.76	0.925	0.495	3.747***	0.44
	T2	49	3.92	0.607	0.518	5.980***	0.50
	T3	49	3.90	1.085	0.438	2.825**	0.38
	T4	49	3.84	0.898	0.457	3.561***	0.42
	T5	49	4.14	0.935	0.453	3.389**	0.44
	T6	49	3.98	1.145	0.250	1.586 (n.s.)	0.25
	T7	49	3.86	0.935	0.387	2.897**	0.38
Training Program Development	T8	49	3.90	0.797	0.548	4.813***	0.55
	T9	49	4.04	0.735	0.491	4.676***	0.51
	T10	49	4.29	0.651	0.652	6.935***	0.70
	T11	49	4.00	0.744	0.410	3.819***	0.44
	T12	49	3.63	0.929	0.263	1.980*	0.24
Instructional Design & Planning	T13	49	4.10	0.770	0.182	1.654 (n.s.)	0.21
	T14	49	4.24	0.751	0.385	3.588***	0.43
	T15	49	4.22	0.823	0.424	3.609***	0.46
	T16	49	4.04	0.912	0.521	3.998***	0.51
	T17	49	3.80	0.957	0.905	6.626***	0.73
	T18	49	4.55	0.503	0.711	9.904***	0.73
	T19	49	4.51	0.505	0.690	9.566***	0.74
	T20	49	4.53	0.616	0.451	5.122***	0.51
Classroom Applications of Educational Evaluation	T21	49	4.24	0.693	0.455	4.695***	0.53
	T22	49	4.31	0.683	0.476	4.878***	0.52
	T23	49	4.35	0.694	0.447	4.510***	0.51
	T24	49	4.29	0.935	0.356	2.662**	0.39
	T25	49	4.10	0.714	0.432	4.234**	0.48
	T26	49	4.31	0.713	0.536	5.263***	0.59
	T27	49	4.31	0.769	0.596	5.424***	0.66

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$; $d = 0.2$ (small effect size), $d = 0.5$ (medium effect size), $d = 0.8$ (large effect size)

Table 5 - T-test Results of Students' Perceptions of TVET Trainers' Teaching Behaviors in the ToT

Section	Survey Question	N	Mean	SD	Mean Difference	<i>t</i>	Cohen's <i>d</i>
Training Needs Assessment	S1	557	3.76	0.945	0.628	15.679***	0.59
	S2	557	3.97	0.956	-0.114	-2.817**	-0.11
	S3	556	3.71	1.116	0.217	4.581***	0.19
	S4	556	3.47	1.035	0.236	5.373***	0.21
	S5	555	3.46	1.041	0.303	6.861***	0.27
Training Program Development	S6	556	3.63	1.059	0.305	6.785***	0.26
	S7	557	4.08	0.941	0.339	8.500***	0.30
	S8	557	4.18	0.931	0.120	3.030**	0.11
	S9	555	3.37	0.991	-0.747	-17.763***	-0.70
	S10	556	4.05	0.970	0.134	3.256**	0.12
Instructional Design & Planning	S11	557	3.71	1.023	0.303	6.983***	0.27
	S12	557	3.75	0.990	0.279	6.644***	0.25
	S13	557	3.80	1.003	0.274	6.453***	0.23
	S14	556	3.72	0.984	0.291	6.976***	0.26
	S15	555	3.60	1.015	0.212	4.915***	0.18
	S16	557	3.45	0.967	0.275	6.720***	0.27
Classroom Applications of Educational Evaluation	S17	557	3.65	1.044	0.394	8.895***	0.33
	S18	557	3.67	1.067	0.288	6.364***	0.24
	S19	553	3.60	1.096	0.219	4.690***	0.19
	S20	557	3.73	1.080	0.304	6.649***	0.26
	S21	557	3.62	1.086	0.389	8.465***	0.34
	S22	557	3.64	1.087	0.397	8.628***	0.34

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$; $d = 0.2$ (small effect size), $d = 0.5$ (medium effect size), $d = 0.8$ (large effect size)

Meanwhile, caution is necessary when interpreting the students' survey results. Two items (S2, S9) out of the 22 survey questions showed statistically significant mean differences between the national level (Study1) and the ToT (Study 2) level surveys in the negative direction. Although it is possible to interpret the results as they are, it is quite unlikely that the ToT program caused such negative effects on the scores for TVET trainers' preparation of learning materials and students' expectations of learning outcomes. Rather, it is more likely that there are unobservable reasons for these differences. For instance, the low scores might have been caused by the relatively short time frame between the distribution of the surveys between Study 1 and Study 2.

Although all of the questions showed statistically significant mean differences between the two surveys for TVET students, the Cohen's effect size values of several items were particularly low (less than 0.2; S2, S3, S8, S10, S15, and S19). These results indicate that although mean differences of these six items were statistically significant, such mean differences are not practically meaningful regarding effect size. Also, it can be interpreted that the training components in the ToT program that relate to these six items need additional improvement.

5.1 Implications for TVET Training-of-Trainers (ToT) in Rwanda and Global Contexts

The ultimate goal of monitoring TVET trainers' teaching behaviors and implementing ToT programs is to ensure quality teaching in TVET contexts. Quality teaching promotes quality TVET graduates who are adequately prepared to join the workforce and thus contribute to social and economic development of the country. From this perspective, the findings of this research provide useful information for stakeholders at different levels, including TVET trainers, training institutions, the Rwandan government, and the international community. First, this research, in particular, the Study 1 results allow in-service TVET trainers to self-evaluate their strengths and weaknesses regarding their teaching and delivery skills; they can also understand which areas of instructional skills they wish and need to develop. To better prepare students with a broad knowledge base and an array of skills, TVET trainers must engage in continuous professional development, and our research outcome can act as a guide. With self-reflection and training, trainers would not only improve their teaching performance and effectiveness, but also develop professional identities, increase their adaptability to changing roles and responsibilities, and strengthen their commitment to the profession.

For the RTTI, the specialized training institute for TVET trainers, the research results can be used as a supplementary quality assurance tool in implementing training programs. As previous studies have shown (e.g., Johanson & van Adams, 2004), training programs for pre-service and in-service TVET trainers have not been systematically established, which results in the use of outdated or irrelevant learning materials and a failure to provide high-quality training. Utilising the survey results from this research as a reference, the RTTI can organise ToT curricula and programs and thus better assist trainers in cultivating essential instructional skills. Especially given the limited budget allocated for the TVET sector, our research findings can help the RTTI take a strategic action to train TVET trainers time- and cost-effectively.

At the national level, the robust development of the national TVET system is critical in realising Rwanda's national development agenda, VISION 2020, which puts human resource development at the core of the agenda so that the country can transform into a knowledge-based economy from a landlocked country that is not richly endowed with natural resources. TVET, as a deliberate intervention within the field of human resource development, can serve as a national strategy to help those in training meet the needs of employers and equip with adequate skills and knowledge that can be adopted in a rapidly changing work environment. Eventually, human resources developed through the TVET system can become a competitive advantage in the global economy and contribute to increasing country's economic super-power. In this regard, our research provides fundamental information that is required to strengthen the national TVET system.

Beyond the national level, our research findings can be beneficial and influential to international TVET communities. Our research was based on the official development assistance (ODA) project carried out by the KOICA with its partnership with the Rwandan government. KOICA, alike other international cooperation agencies, supports many developing countries in various regions in the world to enhance their national TVET systems. Although similar ODA projects that support professional development of TVET trainers in different countries have been carried out, regarding TVET trainers' training outcome evaluation, most of the projects tend to put its focus on attaining information limited to trainers themselves (e.g., satisfaction survey, number of training participants, and achievement rates). However, our research in the Rwandan context was specially designed and implemented to identify the current status of teaching behaviors not only by trainers themselves but also students in the TVET system. Another part of our research that focused on the ToT program also involved both trainers and students to assess the training effectiveness. As one of the few attempts to comprehensively understand TVET trainers' teaching behaviors, especially regarding the survey size and the participant groups, our research can be very informative and insightful to other countries that have a similar interest in TVET.

Furthermore, while a great deal of ODA efforts to enhance TVET trainers' competencies has been continuous internationally, only a limited number of research have examined national TVET practices and discussed the learned lessons from their practices with the international TVET communities, including academic communities. Because trainers are the most important factor that affect students' intended learning outcomes (Woo et al., 2018), more countries that put emphasis on TVET are recognising the need to examine their TVET system and its quality in relation to other countries' cases, especially in terms of trainers' professional development (Ismail et al., 2018; Yu, 2009). In this regard, our research can act as a trigger point to encourage and facilitate more active research efforts to expand TVET knowledge by sharing TVET know-hows, best practices, and experienced challenges with the international TVET communities. This will help each country to learn from each other's experiences and set the guidelines for their future directions for TVET.

5.1 Limitations and Suggestions for Future Research

Despite the contribution of this research in expanding the scholarship on TVET trainers' instructional competencies and their further training, there are several limitations of our research should be noted. First, there were difficulties in attaining the detailed demographic information of the TVET trainers and students who participated in the national-level surveys, such as age, gender, education, prior training experiences, and in-service years. Our interpretation of the survey results is thus limited concerning the participants' different demographic characteristics.

Second, the surveys for Study 2 were administered within a relatively short time frame, approximately two months after the TVET trainers had completed the ToT program. For most professional and supervisory training, program evaluation is usually conducted three to six months after the completion of the training in consideration of retention levels of training or learning outcomes (Griffin, 2014). As discussed above, a short time frame for evaluation may lead to unexpected or uncertain results.

Lastly, the assessments in this research were based on TVET trainers' self-reported perceptions about their teaching behaviors. The potential problem with using self-reported measurements is that respondents who had completed the training program successfully might be more generous or optimistic about their perceived level of change than those who did not complete the program (Ebert-May et al., 2011). How the respondents perceive of their skills can be different from how others see them. In this regard, we avoided entirely relying on the trainers' self-assessments in this research by examining students' perceptions of TVET trainers' teaching behaviors.

Here are our recommendations for future research. Our research findings support the importance of ToT programs of TVET trainers. Further studies can be made to examine the impact of ToT programs in enhancing TVET trainers' teaching competencies. Although the size of the ToT program observed in our research was quite small due to its pilot implementation, studies based on a larger scale and observations over a longer term is welcomed in the future. Also, pre and post-testing design can be employed in further studies to investigate the effectiveness of ToT programs.

Also, we recommend future research to examine TVET trainers' training needs by investigating the trainers and their students' voices. Although the survey results in our research indicate the areas of training that should be further supported for TVET trainers, they are not comprehensive to represent their training needs. Considering that TVET trainers' training needs are complicated by highly changeable market conditions, further studies that pay close attention to TVET trainers and students' voices from actual educational sites are expected.

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