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Jigsaw Pedagogy in Enhancing Economics Teachers' Learning in Free State Secondary Schools

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ABSTRACT The scholarship of teaching and learning the subject of economics, as a school subject is imperative to expose more learners and prepare them for world of work. This study explores how the jigsaw method as a cooperative learning approach impacts the Training of Economics Teachers (ToT) project. A quasi-experimental design was employed. Two hundred economics education teachers were selected and the Test of Economic Literacy (TEL), Economics Modular Test (EMT) and Attitude towards Economics Test (AET) were used to collect data. Findings revealed that statistical significant differences emerged amongst the pre-test and post-test scores of experimental and control groups. This implies that economics teachers in the experimental group, who were empowered in the jigsaw pedagogy as a teaching technique performed better in economics activities as compared to the control. Recommendations are formulated to empower economics subject teachers throughout the Free State province.

INTRODUCTION

The Department of Basic Education introduced a new curriculum policy for South African schools, namely the Curriculum and Assessment Policy Statement (CAPS) for each subject. The CAPS policy focuses on problem-based learning and emphasizes on a learner's centeredness approach towards the fundamental shift forces economics teachers to rethink and reimagine their praxis to be applicable and effective in the classroom. This new approach is driven by active and participative teaching methods (Department of Basic Education (DBoE) 2010), which also implicated to economics as a school subject.

According to the new CAPS, problem based approach curriculum but in particular economics as school subject learners should be stimulated to collect appropriate information and to adjust to current challenges of world of work and the labor market, which requires different set of skills for the 21st century. Traditionally, the teaching and learning of economics in classrooms are very important to understand how markets locally operate. Moreover, teaching economics, teachers need to understand what content to teach, which is stipulated in the CAPS policy, how to teach the subject effectively means they must understand the pedagogy of teaching the subject. Furthermore, teachers need to also understand how and why they must assess learners.

However, currently most teachers are using the traditional teaching methods, which are applicable and the most effective way for producing good results but teachers and lecturers need to relook at learner centeredness approaches to accommodate the diverse learner population. This sentiment is echoed by Van Wyk (2007) that one needs to empower learners with knowledge, skills and values to "to identify problems and find creative and innovative solutions to them by relating them to real-life situations" (p.12) for world of work. It seems needful and therefore compels economics teachers to contemplate suitable and appropriate pedagogies in mandate to attain the learning objectives in the subject. By paying attention to objectives of the lesson, teachers can employ different approaches, pedagogies and models to provide and enhance the required subject knowledge, employable skills and values as a prerequisite for the challenges of the job market (van Wyk 2010).

A range of cooperative learning models that teachers can use are obtainable, for example student team achievement divisions (STAD), teams-games-tournaments (TGT), peer tutoring, think-share-pair and group investigation (GI). However, this study employs the "jigsaw pedagogy" (van Wyk 2015b; Borich 1996; Killen 1998).

Slavin (2011) argues that cooperative learning consists of teaching and learning approaches for teachers to be used for group work that require them to work together to achieve group goals, thereby allowing them to help each other

learn academic content. With Slavin's approach in mind, Johnson and Johnson (1990) propose that cooperative learning as a teaching approach "*consists of five basic principles, that is, positive interdependence, promotive interaction, individual accountability, the teaching of interpersonal and social skills, and quality of group processing"* (p.34). Using so-called "jigsaw pedagogy", a cooperative learning teaching method was developed by Aronson et al. (1978). They then argue that these principles are important for enhancing students' learning abilities.

As part of their study, students were organized in small heterogeneous groups in such a way as to encourage them to break up learning materials into manageable learning components, to assign individual members of the group to each component, to teach other the specific component, which each has mastered, and then work together in combining the components into a coherent whole. Several research studies have concluded that jigsaw learning is effective when it requires each student to become an "expert" in a small part of the group assignment by mastering a specific aspect of the learning material, and then to teach other students in the group the material, which he or she has mastered.

Elliot Aronson (2005) is of the view that the need for a jigsaw method of learning emerged from a specific social context. He goes on to say that the emergence of this idea shows simple ideas can have a significant effect on student learning. Aronson went on to develop and apply the Jigsaw technique in classroom environments as an approach to supporting the cooperative learning approach. His jigsaw pedagogy proposes even more detailed techniques for implementing this approach. The website engages teachers by inviting them to participate in a collaborative process of learning that provides them with a new depth of understanding of the jigsaw teaching strategy.

In general, the jigsaw teaching strategy is a collaborative learning approach that allows individual members of a "home" group to become "experts" in one component of the lesson's content and then to share it with their group, while at the same time learning the content of other components from the other home group members, each of whom has become experts in his or hew own portion of the lesson (van Wyk 2015a; Aronson and Patnoe 1997). The technique requires members of each group to work on small problems associated with the assignment, and then to collaborate in producing a final product. The name for the approach derives from the fact that each person works on a piece of the puzzle, with the group as a whole cooperating to put the pieces together, and thereby achieve understanding of the relevant topic. That is, each individual member of the group contributes a solution to part of the puzzle, and the group as whole produces a solution to the entire puzzle.

Aronson's Jigsaw Classroom also uses this approach. An assignment topic is given to the class as a whole, and each group is then split into small groupings determined by the economics teacher. Each learner in his/her group is compelled to contribute to the overall achievement or success of group. Each teacher then creates a specific report about his or her topic, which is to be presented to the group. As a refinement of this process, each teacher is then required to convene a group that covers their specific topic, which allows each individual to collaborate with others in finalizing his or her report topic. The original groups then reconvene to hear presentations by each group member about his or her respective component, and in so doing, each individual learns about another aspect of the overall topic. After the final product presentations have been given, the participants write a test that evaluates how much they have learned about the topic. The knowledge that participants will be required to write a test about each assigned topic is particularly helpful in creating collaborative and cooperative learning among the individual teachers, as well as among the groups.

This study investigates the impact of the jigsaw pedagogy on economics teachers' learning experiences through a *Training of Teachers* (ToT) program initiated in the Free State Department of Basic Education (FSDBE). The specific objective of the ToT was to empower economics teachers to plan and implement the jigsaw technique in the economics classroom in Free State secondary schools.

The following assumption was formulated for the purpose of conducting this project: *"Teachers exposed to "jigsaw pedagogy" as a teaching technique performed better in economic content knowledge compared to teachers who were not."*

RESEARCH METHODOLOGY

This study is foregrounding in the post-positivist-constructivist paradigm. A non-experimental research design was used by incorporating pre-test and post-test (van Wyk and Taole 2015; Mouton 2001; Gray 2004). An open invitation was sent to all economics teachers to participate in this study. A purposive sample of 200 economics teachers was identified to voluntary participate in the project during school holidays. These teachers, who were teaching the subject, had experience that ranged from two to thirty-two years of service. Other characteristics of these teachers were male (36%) and female (64%) teachers from the different educational districts. The sampling comprises of novice (39%) to experienced teachers (61%). For the data collection, the Test of Economic Literacy (TEL), a standardized test of economics content was employed. The test consisted of 50 items and measured the teachers' general economic literacy levels. The TEL is nationally a norm-referenced test used in the United States for first-year economics classes at university level (NCEE 2005). Secondly, the Economics Modular Test (EMT), which covered all six units of the seminars of the ToT project. The EMT was design and consisted of Economics CAPS curriculum content for grade 10, namely macroeconomics (25%), microeconomics (25%), contemporary economic issues (40%) and globalization (10%). This tool was used to measure teachers' specific subject content knowledge. The last tool for data collection was the Attitude towards Economics Test (AET). This test consisted of 45 items. The purpose of this tool was to measure goal orientation, self-efficacy, intrinsic motivation toward economics, and cognitive processing of teachers before and after the training. The items in the three questionnaires were designed to collect attitudes, performances, and classroom interactions during the jigsaw pedagogy information, as well as to determine how each teacher's use of cooperative learning techniques in economics teaching during treatment and control groups. The Cronbach alpha coefficient measures the reliability of items in the questionnaire (van Wyk and Taole 2015; Cohen et al. 2009; Gray 2004). Furthermore, Cohen et al. (2009) indicated that this Cronbach alpha coefficient as an indicator measures "the accuracy and precision of the different items in the measuring instrument" (p.123), as revealed in the different data tables for this paper. Application was submitted for ethical clearance to the FSDBE. After permission was granted, all participants were provided with a copy of consent letters as well as ethical clearance letters. The FSDBE official letter indicated protection of confidentiality of any names, schools, stakeholders and the results deriving from this study will be treated confidential.

RESULTS

Application of the Jigsaw Strategy Towards Teachers' Attitudes

This part of the questionnaire focuses on teachers' attitude on the different learning activities towards the teaching method during the training sessions. A t-test was computed and information generated is displayed in Table 1.

According to the information provided, the treatment group teachers show positive results regarding the jigsaw teaching method as compared to the control group. Only forty-nine percent of the control group indicated that *"they disliked cooperative learning activities"*, while treatment group approved jigsaw techniques during the training sessions. The findings in the table indicated that statistical significant differences existed regarding the t-values amongst the treatment and control groupings. Moreover, the experimental group is positive about the jigsaw teaching method because this method is supportive in enhancing how to use concept mapping and handheld devices during the sessions.

Findings revealed statistical significant difference emerged from the two groups in this study. Finally, all four items tested 'strongly agree' to 'agree' on all items in the questionnaire, and were statistically significantly different as compared to the control group in this study.

Computing Jigsaw Strategy on Teachers' Performance Scores

Table 2 shows the changes in three instruments, namely the TEL, EMT, and AET scales.

Based on the information in Table 2, data collected was computed and all three data collection instruments indicated statistical significant differences between the two groups. The Cronbach alpha reliability test (α=0.7) is met by

Table 1: Teachers' attitude towards learning Jigsaw activities (n=200)

Q. No.	*What are your views regarding your attitude towards jigsaw activities during the training sessions?*	*Different groupings*	*Strongly agree and agree (%)*	*Disagree and strongly disagree (%)*	*Mean scores*	*Group t-value*
1	I support the jigsaw method as excellent teaching method	Treatment Control	89 70	11 30	3.9 2.9	3.81**
2	My expert group help and were supportive during the activities	Treatment Control	61 59	39 41	3.9 2.9	2.93**
3	I support the concept maps on economic topics	Treatment Control	69 60	39 40	3.9 3.1	3.11**
4	I like the way the my group do the presentation of mind maps to display economic concepts	Treatment Control	79 67	21 33	3.9 3.1	3.2*

*p<0.05; **p<0.01

Table 2: Teachers performance scores

Data collection instrument Change	*N*	*Cronbach alpha á=.7*	*Pre-test*		*Post-test*		*Outcome*		
			Treat-ment	*Control*	*Treat-ment*	*Control*	*%*	*t*	*Sig. (2-tailed)*
TEL	200	.891	59.5	48.8	73.1	58.8	36.0	3.24**	0.000*
EMT	200	.794	57.1	50.9	66.3	63.9	22.3	2.09*	0.003**
AET	200	.811	67.5	50.8	74.1	55.8	23.0	1.656	0.000*

*Test= 100 scoring; *p<0.05; **p<0.01; á=0.7.0

all these instruments. The treatment group (TEL=59.5; EMT=57.1 and AET=67.5) outdid the control group in all three test instruments. The experimental group outperformed the control group in both the pre-test and post-test results in this case.

Classroom Discussion Amongst Teachers During Training Sessions

With reference to Table 3, the results between the two groups show that there was good interaction between facilitators and teachers.

Table 3: Classroom discussions amongst groups (n=200)

Q. No.	*What are your views regarding the group behaviour?*	*Different groupings*	*F*	*%*	*Mean*	*t-value*
5	We enjoy how our group exchange economic information	Treatment	64	32	3.1	3.40**
		Control	36	18.5	2.8	
6	We did received constructive feedback where we were good and what gaps we need to work on after we presented our topis	Treatment Control	86 80	89 87	3.1 2.9	3.89**
7	We as a group support and encourage other members of our group	Treatment Control	89 67	67 60	3.8 2.8	2.88**

*p<0.05; **p<0.01

Based on the data provided, it is evident that the classroom behavior plays an important role in how teachers in the training sessions interact. According to results, the experimental group exchanged more information (ranging from t=3.00 to 2.68) compared to the control group.

Teachers Perceived Interactions in the Group Learning Activities

In this part of the questionnaire, respondents were asked how they view the group learning activities during the facilitation process.

Based on the information, the experimental group views that they interact and exchange ideas on how collectively they complete group learning activities as related to the control group. Respondents agreed to strongly agreed that they interact, good interactions amongst each other, work collectively on a task and trying to build favorable relations amongst each other in the study (Table 4).

CONCLUSION

In conclusion, the experimental group performed better in all three tests regarding economic literacy, subject knowledge, and pedagogical skill. This implies statistical significant differences between the pre-test and post-test scores of the groups emerged. This implies that teachers exposed to the jigsaw pedagogy as a teaching technique performed better in economic literacy compared to teachers who were not.

It is evident that the jigsaw pedagogy employed during the ToT project impacted significantly on the teachers' learning in economics education. The jigsaw pedagogical method is an effective cooperative learning strategy, which demonstrated if teachers carefully plan and implement this pedagogical method, and whether it can achieve desired learning outcomes in any school subject. Other indirect information emerged from the data set that the jigsaw teaching method supports active and participative learning, and teachers need to create classrooms for optimal learning, which this method use to increase learner performance in the subject.

In view of the latter concluding remarks, the following recommendations are formulated to enhance and sustain the implementation of the jigsaw teaching method for further research. The results shows positive indications for both the subject and pedagogical content knowledge epistemologies, nonetheless it is problematic to oversimplify effect on teacher literacy, subject

Table 4: Teachers views regarding interchanges and collective learning activities (n=200)

Q. No.	*What are your views regarding interchanges and collective learning and collective learning activities during the training?*	*Different groupings*	*Strongly agree and agree (%)*	*Disagree and strongly disagree (%)*	*Mean scores*	*Group t-value*
8	We had excellent exchanges of ideas and collectively agree on our concepts before we presented our group presentation	Treatment Control	98 70	2 30	3.8 3.1	3.87**
9	We were provided with clear objectives by the facilitator what was expected from groups before our presentation	Treatment Control	91 88	9 12	3.7 2.9	2.99**
10	We as a group understood our goals and work as group to achieve our goal using different types of economic concepts to display our mind maps	Treatment Control	88 84	12 16	3.7 3.2	2.87**
11	We a group support n to built good intergroup relationships to complete and to obtain our goal	Treatment Control	96 77	4 23	3.8 3.0	2.9*

*p<0.05; **p<0.01

and pedagogical content knowledge cannot emerged from short and single investigation but needs further investigation to determine the real outcomes of the project. A longitudinal study will produce and report other findings to the betterment of the subject and pedagogical content knowledge. In view of the latter, a more prolonged and extensive treatment may be needed to confirm that using the jigsaw method brings about radical changes in teachers' attitudes. To achieve more conclusive findings, the attitudes of teachers toward jigsaw as a cooperative learning method should also be explored using a qualitative study, which maybe yield different findings. It is therefore recommended that further research studies should be conducted during which groups are rotated and members' group membership changed following each lesson. A series of further studies on cooperative learning at the secondary levels (grades 10 to 12) of economics education should therefore be undertaken.

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