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*Full Length Research Paper*

# Poverty alleviation through teaching for thinking: A case of one teachers' college in Masvingo Province

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**There is an assumption that education is incapacitated to alleviate poverty. The objective of this study is to explore the nature and impact of education being offered at one teachers' college in Masvingo Province. The study argues that the college is not offering education, which is instrumental for poverty alleviation. Qualitative data were generated using in depth interviews, focus group discussions and observation. The researcher used content analysis to analyze the data. The study revealed that the college curriculum is examination driven at the expenses of practical subjects which may see the college going a long way in alleviating poverty. The study also established that students leave the college with useful skills but are not empowered to realize the utility of acquired skills. The study concluded that although learners pass their examination poverty is rampant. The research recommends policy makers to align education to poverty alleviation as well as incorporating innovation for socio-economic change.**

**Key words:** Critical, thinking, poverty, teaching, alleviation.

## INTRODUCTION

Africans had their own type of education which was relevant and functional (Akinpelu, 1981). Colonialists who came to Africa considered Africans barbaric and a people without an education system (Asante, 2007). This excuse was used by the colonialists to introduce their type of education which was not relevant to the African way of life. The advent of western education saw a shift from the way indigenous education was viewed yet it was instrumental in solving societal problems. In this paper, the author examines and discusses poverty alleviation through teaching for thinking at one teachers' college. The paper intends to explore the necessity of teaching students in teachers' colleges to think in order to alleviate poverty. One may wonder why students should be equipped with thinking skills yet colleges have been

training teachers for years. This has been necessitated by its products who are not doing enough to alleviate poverty. Women of Zimbabwe Arise (2010) states that the entire education system promotes blind obedience and rote learning than developing critical and imaginative thinkers. The argument above indicates that education is not doing enough to equip students with critical thinking which is key to problem solving vis-a-viz poverty eradication.

## Background to the study

The problems of utility of education in Zimbabwe are situated in the colonial context (Zvobgo, 1994) The need to have an education system to alleviate poverty is

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necessitated by the legacy of inheriting an education system from the Western imperialists. At any given time education should serve the purpose of transforming a society for the better. However, the education system that was introduced by Western imperialists was geared towards producing submissive and docile citizens (Zvobgo, 1994). Therefore, it requires a deconstruction of colonially inherited education system and reconstruction of one that emanates from the needs of the society (Hapanyengwi and Makuva, 2014). The stand point is that education seems to be incapacitated in equipping students with critical thinking skills (Women of Zimbabwe Arise, 2010). Therefore, this study calls for the infusion of thinking skills in teaching and learning at Masvingo Teachers' College. Before Zimbabwe attained its independence it was rooted in the history of colonialism. Whites were educated for key posts in economic political and other spheres of life. On the other hand, Africans were trained for menial jobs on the farms and whites' homes (Zvobgo, 1994). The transformation of education following the fall of colonial rule was a move to alleviate inequality. The government wanted to bring education to all people and also to make education an instrument for social and economic reformation. However, nothing was done to equip students with critical thinking skills to eradicate poverty. The argument is that education being offered at Masvingo Teachers' College does not equip students with thinking skills needed to alleviate poverty to enhance socio-economic development.

Research has shown that a number of people are lamenting that education offered in teachers' colleges and the tasks which they are given are not aligned to problems they encounter in real life situations (Chartered Institute of Management Accounts, 2001). The most important practical thinking skills education should equip one with is how to identify a problem. Dewey in Akinpelu (1981) and Beyers (1988) suggests that finding strategies of solving problems is by way of participatory learning where students will use skills they have learnt in class to solve similar problems they will encounter in life. Nziramasanga (1999) recommended that the curriculum from pre-school to tertiary be practical to enhance critical thinking. Thus this research sought to find out the extent of implementing the recommendations proffered by Nziramasanga Commission.

Critical thinking in teaching and learning is facilitated by a physical and intellectual environment that encourages the spirit of experimentation and discovery (Keefe and Walberg, 1992; Adsit, 2015). If students are encouraged to be critical thinkers they would be less dependent on teachers and authoritative sources (Karakoc, 2016; Murawski, 2014). If a person is independent he or she can think independently and thus can solve problems encountered in the society (Heyman, 2008). Further, the student would be able to evaluate situations as they arise and change structures in society. Thus considering teaching students to think would allow them to find

means and ways to alleviate poverty. If education is geared towards teaching for thinking poverty would be curbed and thus enhance socio-economic transformation. There is an outcry that what is being taught in schools is not appropriate for the world we are moving into. The outcry is necessitated by the fact that poverty has emerged as the main concern in Zimbabwe (Mlanga, 2018; Machamire, 2015; Zhangazha, 2018). The argument is that knowledge grows out of date due to the dynamic nature of society. It is important to admit that knowledge which used to be relevant long ago may not be doing enough today (Dewey in Akinpelu, 1981). So the most important thing we can do is to teach students to think well. This means giving students practice in reasoning through class discussion involving concepts that cut across disciplines rather than only those that are embedded in each discipline. This can only be realized through teaching for thinking.

Nziramasanga (1999) argues that both parents and children no longer see any tangible gains from education. Students need to be equipped with thinking skills in order to survive in the challenges of ever changing needs of the labour market. Nziramasanga Commission went on to recommend a new education that familiarized students with vocational and technical skills which were intended to develop skills that could be useful in specific jobs. However, some changes and innovations were not as good and relevant as they should have been (Women of Zimbabwe Arise, 2010; Zvobgo, 1994). In as much as vocational subjects may be useful in poverty eradication, they should be punctuated with critical thinking.

## RESEARCH QUESTIONS

### Major research question

To what extent can critical thinking be aligned to teaching instructions at Masvingo Teachers' College?

### Sub-questions

- (1) What is critical thinking?
- (2) To what extent do subjects offered at Masvingo Teachers' College promote critical thinking.
- (3) How does critical thinking assist to alleviate poverty?
- (4) How can critical thinking be promoted in the college curriculum?

### Statement of the problem

The problem is that the education being offered in the teachers' college is not geared towards poverty alleviation. Critical thinking involves thinking about real problems in a bid to find solutions. Therefore, critical



thinking is a vital tool in solving problems.

### **Limitation of the study**

The main limitation was that the respondents may have given biased responses as the research was unraveling attitudes and feelings about the education being offered. However, the use of three data collecting instruments counteracted the biases.

### **Delimitations**

The study was situated at Masvingo teachers' College in Masvingo Province in Zimbabwe.

### **Significance of the study**

The significance of the study is to give some insights into the importance of teaching for thinking. The research was also carried out to raise some awareness to curriculum planners on the need to anchor what is taught in teachers' colleges to critical thinking. It is assumed that the research is going to add value to the theory of education. To add to that if students at teachers' colleges are equipped with thinking skills poverty might be minimized.

### **Theoretical framework**

This study is hinged on pragmatism and philosophy for children (P4C); from colonial bondage brought about by the British by introducing an education system which aimed at producing docile, sub missive and aimless people (Zvobgo, 1994). Pragmatic views of John Dewey among others are influencing the argument for teaching for thinking. The idea of critical thinking emanating from (P4C) is to be explored.

### **Pragmatism**

Pragmatism is a philosophy that encourages people to seek processes and do things that work best to achieve results (Ozman & Craver). Traditional ways worked very well in their time and may not be doing enough to solve today's problems. So pragmatism seeks to challenge traditional ways of thinking and practices and reconstruct our approach to life in line with our needs.

Bacon in Stumpf (2003) argues that the method used during his time, that is deductive reasoning was based on religion and speculative philosophy. In other words Bacon encourages people to refrain from putting faith in old beliefs, generalisations which may not have validity and reliability today. The philosophy calls for people to think outside the box and develop valid knowledge which will help in curbing societal problems (Curren, 2011). So this

philosophy is informing this research in that it aims at alleviating poverty which is also a social problem.

Dewey's instrumentalism is considered as the answer to problems faced by Zimbabwe. Dewey states that instead of dealing with fixed theoretical constructs societies need to focus on a philosophy which concerns itself with human problems in a world which is uncertain and changing (Ozman and Craver, 1986). For Dewey ideas are instruments in solution to problems in a society. In his book "How we think" Dewey illustrated how ideas can be used to solve problems (Akinpelu, 1981). Pragmatism views education as instrumental in solving problems. So education can be used to solve or alleviate poverty if learners are equipped with the necessary thinking skills. If education some time ago was used to solve problems, it is the same education which should be crafted to suit the current trend. Pragmatists argue that the world is not closed, existence is precarious and unpredictable and people cannot expect to find lasting solutions (Ozman and Craver, 1986; Karakoc, 2016). The answer is equipping students with thinking skills. The role of education is to renew people so that they are able to solve problems they encounter in life (Kneller, 1991; Bailey et al., 2010). Like Plato, Dewey is against treating education as separated from life (Kneller, 1991; Blake et al., 2008). Thus education has to promote understanding. Freire (1972) is against the banking approach where learners are treated as empty vessels when knowledge is poured. Teaching should enhance understanding, thus promoting utility of the gained knowledge to useful ends. Helping students to think becomes education and not just training. This can be done through learning directed towards growth. Education is seen as an experimental enterprise as well as a tool that assists in social renewal (Dewey in Akinpelu, 1981; Curren, 2011). A useful education promotes humanistic spirit in people as well as the desire to find new answers to our day to day problems in economics, politics and social problems. Angelo (1995) and Murawski (2014) highlight that a true education should develop thinking skills that produce true individuals who are self-reliant and who do not rely on tradition or custom in solving problems. People have to rely upon their intelligence in solving problems. Hence education is viewed as having the potential for thinking to alleviate poverty (Dewey cited in Ozman and Craver, 1986).

Education is not about readymade answers to every problem but formation of mental attitudes in attacking contemporary problems (Stumpf, 2003). When poverty arises, education should be reconstructed to meet the challenges. This simply means an education which is pragmatic aimed at doing processes that work.

### **Philosophy for children (P4C)**

Philosophy for children is not to make children to do

philosophy (Beyers, 1998). It is argued that children or students at colleges lack reasoning skills and yet these skills are the foundation of solving problems. Students lack the ability to analyze, to evaluate, to make decisions, judgment and the ability to be independent thinkers. To buttress this view, Lipman (1991) and Adsit (2015) point out that schools are failing to equip students with skills and competences that will enable them to respond to the changing world. The researcher argues that there is rampant poverty in Zimbabwe because products from colleges lack thinking skills to enable them to minimize poverty.

It seems the curriculum at Masvingo Teachers' College does not equip students with thinking skills yet these are the pillar for problem solving. The researcher is not calling for the inclusion of thinking in the college curriculum but that teaching for thinking be the main thrust in teachers' colleges. Oliver and Utermohlen (1995:2) posit that "students are passive receptors of information through technology." Hence students need a guide to weed through the information. Therefore, students at colleges need to be taught to analyze information that they get and by so doing they will learn to think through issues and be prepared to solve real problems in life. Oliver and Utermohlen (1995: 2) further highlight that "students need to develop critical thinking in their academic studies so that they can apply the learnt skills to the problems they will encounter in life". P4C also borrowed a lot from Plato and Aristotle who argue that learning should be centred on creative thinking as opposed to passive thinking. Murawski (2014) supports by saying critical thinking is a key in education as it helps students to solve problems in school and at home. Thus education should provide a base for teaching for thinking to make it more relevant and useful.

Philosophy for children is concerned with cognitive, moral and affective development. The community of inquiry, the major tool for teaching philosophy for children is rooted in Socrates' claim that collaborative communities have the capacity to foster critical thinking (Beyers, 1995; Adsit 2015). Therefore, lecture rooms become community of inquiry in which the focus will be on dialogue. Research has shown that philosophy for children improves cognitive abilities of participants by developing general thinking and reasoning skills (Halpern, 2001; Letseka and Zireva, 2013). Knowledge grows out of date and if people continue using it without much thought societies will continue having problems such as poverty. Therefore, the most important thing is to teach students to think well. This can be enhanced through classroom discussions involving concepts that cut across disciplines. If students are given instructions in reasoning they become accustomed to asking each other for reasons thereby developing critical thinking. Philosophy for children aims at teaching reasoning and argumentative skills to children. If students lack critical thinking skills they cannot alleviate poverty.

## Critical thinking

Critical thinking is considered as the fountain of all learning processes. That being the case it is suggested teachers' colleges to teach it (critical thinking). Beyers (1995), Murawski (2014) see teaching of critical thinking as pivotal to the development and advance of the nation. He further states that to live successfully people have to think critically. Critical thinking is the intellectually, disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and evaluating information so as to guide action (Scriven and Paul, 1996). Angelo (1995) highlights that critical thinking is characterized by the application of rational, higher order thinking skills such as reflection analysis, synthesis, problem recognition and problem solving; Letseka and Ventor (2013) and Zireva and Letseka (2013) argue that critical thinking is judging the authenticity worth of something. Critical thinking is thus a process of precise and objective analysis of any claim so that judgment can be passed. Letseka and Zireva (2013) are of the view that the main aim of education should be to foster critical thinking. Letseka and Zireva went on to say critical thinking is the most important skill a student both at school and college can be equipped with. In the same line Oliver and Utermohlen (1995) aver that students need to develop and effectively apply critical thinking skills in their learning and to the critical choices they will make in life. In the same vein, Beyer (1995), Radulovic and Stanic (2017) pin-point that critical thinkers are open minded, respect evidence and will change positions whenever there is need and when reason leads them to do so. Critical thinking is also marked by the ability in such a way that one is able to recognize the strengths and weaknesses of an idea and then focus the thinking to produce better results (Centre for Critical Thinking, 1996).

Critical thinking also involves thinking about real problems. One can reason out but the essence of critical thinking comes to the fore when one is addressing real problems rather than artificial ones (Angelo, 1995). The argument is that real problems are unclear. Hence they need great thinkers. Critical thinking is not just a mere mental exercise. It is an analysis of results (Letseka and Zireva, 2013). A person with good memory and knows a lot of facts is not necessarily a critical thinker. Angelo (1995), Zireva and Letseka (2013) argue that a critical thinker is one who can deduce consequences from what he or she knows and is able to make use of information to solve problems. At the heart of critical thinking is thinking about real problems (Beyer, 1995). So critical thinking involves noticing that there are problems that need to be addressed and in this case eradicating poverty. A mental engagement may not be considered as critical thinking. When one is thinking critically he or she would be thinking through a decision about what to do in a situation, and then followed by an action. So

when people are faced with poverty they should think through ways of eradicating it.

It is the author's contention that if critical thinking is infused in teachers' colleges curriculum the students will be able to cope with problems they will face in their societies and the world at large. As alluded earlier, students at teachers' colleges are not able to think critically. This might be attributed to the Zimbabwean society which is examination driven. The scenario may result in producing students who leave colleges without being equipped with the relevant skills they will use in their day to day lives.

### Poverty alleviation through teaching for thinking

The ability to think critically is important whenever people face problems because it enables them to reach their ends (Beyer, 1995). Being able to think critically and solve problems is an asset in poverty alleviation. In societies characterized by problems such as poverty the society needs critical thinkers who can reflect on issues at hand. Thus critical thinking is instrumental in solving problems. Chan (2002) argues that critical thinking is attached to creative solution to a problem. Hence the author suggests that at teachers' colleges students be taught critical thinking so that they would be able to assist in minimizing poverty thereby promoting innovation for socio-economic transformation.

Thinking critically is crucial in solving societal problems. For people to tackle challenges they encounter in life they need critical thinking skills. Therefore, if students are equipped with this skill (critical thinking) they would be able to analyze and evaluate ideas, select best ones and apply them to solve problems. As critical thinking is the ability to recognize the existence of problems it may help in reducing poverty. Students will be able to identify problems and think about ways of addressing them.

## RESEARCH METHODOLOGY

In this study a qualitative case study was adopted. Arthur et al. (2013), Chisaka (2013) and Cresswel (2014) defined a case study as a particular phenomenon in its natural setting. Similarly, Flick (2014) and Silverman (2013) highlighted that a case study has an advantage of allowing the researcher to ask participants questions and observe incidents in their contexts. Mills and Birks (2014) and Clark (2016) in support aver that a case study is an inquiry which gives detailed information. The researcher adopted a case study because it allowed the researcher to get rich information which allowed analysis on the data obtained to build a theory or phenomenon.

### Research paradigm

A research has to be informed by a philosophical base. Sinclair (2007) and Flick (2014) argue that a theoretical framework of a research is the base on which the research is taking place. This

research is informed by the critical theory. The theory strives to challenge existing practices. The theory is suitable because it aims to unravel the attitudes, feelings and beliefs of lecturers and students.

### Research design

Arthur et al. (2013) and Magwa and Magwa (2015) state that a research design is a plan which shows how a research is conducted. In this research a case study was adopted. Cohen et al. (2011) define a case study as an instant designed to illustrate a general principle. Therefore, the findings of this study will be generalized for other teachers' colleges information. The researcher used a case study so that focus would be on a small population. This enabled the researcher to obtain deep and rich information. The researcher carried out a pretest on a small scale to check the practicability of the instruments.

### Research instruments

The research was based largely on qualitative using interactive methods. The researcher used open ended questions in in-depth interviews which were semi-structured. Cohen et al. (2013: 382) point out that "open ended questions enable participants to write a free account on their own time, to explain and quantify their responses"; Chilisa (2012), Clark (2016) and Magwa and Magwa (2015) cohere by saying open ended questions allow participants to give information without limitations. Therefore, open ended questions were adopted as they allowed participants to give information as much as they could. Magwa and Magwa (2015) and Cohen et al. (2013) state that an interview is a method of asking questions to get information. The study employed in-depth interviews as they allowed the researchers to get a lot of information. Cresswel (2014), Riches et al. (2014) and Chilisa (2012) agreed that in-depth interviews allow researcher to get information about thoughts, attitudes and feelings. The researcher used this method because it allowed multiple sensory channels; hence it enabled participants to stress their views.

### Interview

An interview is a direct verbal interaction between individuals with the aim of collecting information. Clark (2016) and Magwa and Magwa (2015) describe an interview as a tool which allows the researcher to get information from participants. It involves one on one interaction. The researcher chose the interview methods because this allowed further probing for more information. Interviews were conducted with ten lecturers. The researcher had more time to explain the questions to the respondents and also could see more verbal clues.

### Interview guide

The researcher used an interview guide to guide the interview process. The questions were written on paper and were used by the researcher to keep the participants on track. The guide also contained questions which were used by the researcher to probe the participants for more information. To avoid misunderstanding of questions the researcher asked clear and precise questions. The researcher also carried out a pre-test with 2 lecturers and 4 students who were not among the chosen participants. This was done to check the reliability and validity of the instruments. The researcher checked for ambiguous words, redundancy and irrelevant issues.

### Focus groups

The researcher also used focus group discussions with students. Magwa and Magwa (2015) and Clark (2016) indicate that a focus group refers to a group of people who are asked the same questions at the same time. Similarly, Authur et al. (2013) posit that focus groups are a way to obtain many opinions from people within a group setting. The researcher used one focus group composed of ten students. The aim was to get numerous views in an interactive way. This enabled the researcher to get rich information. The researcher also used focus groups to verify the responses that were obtained through interviews. This coheres with Authur et al. (2013) and Flick (2014)'s submission that focus groups can be used to support other methods. The researcher ensured that the group did not go off topic by focusing the participants on issues under discussion.

### Sampling

Of the six hundred general course students at the college under study the researcher purposely selected twenty students and ten lecturers. The students who were selected were the products of the education offered at the college. The lecturers who were selected were the implementers of the curriculum in question. Hence both the students chosen and the lecturers had an experience of phenomenon under study. The researcher used the stratified sampling. The researcher used two sub-groups, that is, males and females. The researcher selected 5 males and 5 females to ensure the likelihood of representativeness.

### Ethical considerations

Ethical considerations are taking into account, the confidentiality and rights of participants (Cresswel, 2014; Flick, 2014). Ethical issues such as respect of privacy, confidentiality, informed consent, non-maleficence (Cohen et al., 2013; Authur et al., 2013) were observed. The consent of all the participants was sought by making them (participants) to sign a concept form. The form indicated that participation was voluntary and that they could withdraw from participation if they wanted. The researcher also told the participants that she would use pseudonyms. Participants were also informed that the research was not going to harm them in any way since the purpose of the study was purely academic.

### Data analysis

The data that were purely qualitative were presented in a narrative form. The transcribed data were presented verbatim so that the flavour of the participants' responses was not lost (Mills and Birks, 2014; Magwa and Magwa, 2015). The researcher came up with themes that were derived from the research questions. The data that focused on a particular issue were put together (coding) and analyzed following those themes. Cresswel (2014) and Hamilton and Whittier (2013) highlight that content analysis focuses on the analysis of human communication. Thus it focuses on summarizing pertinent issues in the text and the contents in it. As the data were collected by means of communicating with participants the content analysis was appropriate (Table 1).

## FINDINGS

The study revealed that education that was offered at one of the Teachers' college in Masvingo province did not

equip students with skills to think critically. These are some of the views that were given by the participants: Students are taught a number of practical subjects; however, the subjects are not improving their livelihood. Our children are receiving useless education. Our students cannot upgrade their lives when they leave teachers' college.

The views of the participants indicated that education given to the young generation is not serving any purpose. The students cannot think outside the box to make ends meet. This confirms to Dewey's assertion that education should be instrumental (Akinpelu, 1981). The fact that students are taught practical subjects but cannot improve their livelihood means that they lack critical thinking skills, yet these are the keys to solving societal problems. In support, Letseka and Ventor (2013) highlighted that critical thinking is the ability to assess the problem or situation of something. In the same vein Letseka and Zireva (2013) point out that the major aim of education is to equip students with critical thinking skills so that they can solve problems encountered in real life situations. One participant indicated/cited philosophy for children (P4C) as pivotal in teaching children to think critically. From the participants' views it is apparent that the education that is given to students teachers is not doing enough to alleviate poverty. To verify the views that were given by lecturers, the researcher had focus group discussion with the students. The results from focus group discussions revealed that the type of education that was in Teachers' Colleges was too academic. These are some of the views they preferred:

Our curriculum is not practical oriented. The curriculum is too academic. Further, the subjects that are offered do not make us critical thinkers. Most of us are languishing in poverty yet we acquire certificates of education. This is a testimony that we cannot think critically. Our education does not equip us with thinking skills that are necessary to make us survive in these hard economic situations. Most of the time we run out of ideas. I feel our education teaches us to memorize facts and this does not assist us in any way to solve problems.

The participants were in agreement that the type of education they were receiving was not doing enough to assist them to survive. These views seem to confirm Zvobgo (1994)'s submission that Zimbabwean education is too much centered on academic issues. The participants revealed that whilst many people had acquired certificates or a diploma in education poverty was rampant in the society. This signifies that education given in teachers' colleges was not assisting students in any way to think for solutions. This is in congruency with Dewey's argument that education is not a preparation for life but a tool for problem solving (Ozman and Craver, 1986). The students further indicated that:

Technology was to blame in making students non-thinkers since they got ready made answers in the

**Table 1.** The demographic profile of participants.

<b>Participants</b>	<b>Profession</b>	<b>Gender</b>	<b>Experience</b>
A	Lecturer	Female	Principal
B	Lecturer	Male	Lecturer
C	Lecturer	Male	Senior Lecturer
D	Lecturer	Female	Lecturer
E	Lecturer	Female	Senior Lecturer
F	Lecturer	Male	Principal Lecturer
G	Lecturer	Female	Principal Lecturer
H	Lecturer	Male	Principal Lecturer
I	Lecturer	Male	Senior Lecturer
J	Lecturer	Female	Senior Lecturer
<b>Participant</b>	<b>Status</b>	<b>Gender</b>	<b>Experience</b>
1.	Students	Male	Final Year
2.	Students	Male	First Year
3.	Students	Male	Final Year
4.	Students	Female	First Year
5.	Students	Female	Final Year
6.	Students	Male	Final Year
7.	Students	Female	First Year
8.	Students	Male	First Year
9.	Students	Female	Final Year
10.	Students	Female	First Year
11.	Students	Male	Final Year
12.	Students	Male	First Year
13.	Students	Female	Final Year
14.	Students	Female	First Year
15.	Students	Male	Final Year
16.	Students	Male	Final Year
17.	Students	Female	Final Year
18.	Students	Male	Final Year
19.	Students	Female	First Year
20.	Students	Female	First Year

internet without any effort. During assignments writing most students just cut and paste other people's work. This also contributes to the production of docile products.

The study revealed that the education offered at the teachers' colleges was not geared towards equipping students with thinking skills. It emerged that technology which characterized most educational activities had a stake in the production of students who lacked critical thinking skills. In support, Oliver and Utermohlen (1995) avers that that technology is assisting in the production of students who are not thinkers. This contributed to the production of passive and docile students who just copy answers from the internet without thinking. This scenario brings challenges to sustainable development.

### Conclusion

The study demonstrated that student teachers at

Masvingo Teachers' College acquire some skills. However, the findings revealed that the skills that the students get at the college are not sufficient to help them to alleviate poverty in society in which they live in. It emerges that the college curriculum is too much focused on subjects that do not assist students to think critically yet education should be instrumental in solving societal problems. The results further revealed that teaching for thinking is critical if poverty is to be alleviated. The findings indicated that the college curriculum was characterized by colonialist tendencies which was academic oriented and was not addressing problems in Zimbabwe.

### RECOMMENDATIONS

It is recommended that:

- (i) Students be taught critical thinking skills.

- (ii) The college curriculum should incorporate Philosophy for children (P4C) which teaches children to think critically.
- (iii) The students be taught entrepreneurship skills in schools.
- (iv) Practical subjects to be compulsory at the teachers' colleges.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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*Full Length Research Paper*

# Impact of note taking during reading and during listening on comprehension

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**This study aims to determine possible impact of note taking during reading and listening on Turkish Language prospective teachers' comprehension success. Moreover in the study comprehension scores of the groups were investigated in terms of academic score and gender variables. Study was designed in causal-comparative research. The study was conducted with 72 s graders studying at the Department of Turkish Language Teaching at Education Faculty of Hatay Mustafa Kemal University. The Comprehension Achievement Test was employed in the study to determine reading and listening comprehension achievement scores of the students. In the study, an informative text containing 640 words and named as "Childhoods of the Famous Scientists" was used. At the end of the study it was found that Listening-Note Taking groups' comprehension scores were statistically more successful than Reading, Reading-Note Taking and Listening groups. There was a positive-way relation determined between the students' comprehension scores and their academic grade point averages. And in terms of gender there was no statistically significant difference between female and male students.**

**Key words:** Note taking, listening, reading, comprehension, gender, academic score.

## INTRODUCTION

Note taking is a skill that is frequently applied during school years. Note taking, mostly used from primary school to university years, is preferred in everyday life after university as well. When it is regarded in terms of timing, note taking is a skill that has two components. The first one is about the moment when note is taken, about focusing on the things seen, read or listened, and about concentrating on that moment. The latter one is about recording notes for using in the future.

There are a great number of definitions made about note taking. Boch and Piolat (2005) described note taking

as shortening important information for later use and writing in symbols rapidly; in other words, as creating external memory. According to Piolat et al. (2005), note taking is a complex activity that requires one to understand and choose information and necessitates written production processes. Moreover, Zhang (2012) described note taking as writing main idea and important points regarding the information presented during listening. On the other hand, there are some researchers who described note taking as a negative activity. For instance, Zuckerman (2016) stated that note taking is a

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miscellaneous and complex process that leads students to take unfruitful or incomplete notes.

### **Benefits of note taking**

Note taking is a technique that is highly effective on comprehension. Taking notes during lesson helps students reach aim of the course more comfortably and makes them to understand what is taught easily (Kiewra, 1991). The students who take notes are advantageous in terms of getting the most important points of the course and recalling content of the course (Kiewra and Fletcher, 1984). Note taking has many advantages the foremost of which is relieving students of reading the whole book. It improves students' comprehension skills since it attracts students' attention to the material that is read or listened. It prevents students from missing the things taught during the lessons. Additionally, it helps students recall the important information they learnt and makes them independent (Bahrami and Nosratzadeh, 2017; Saravani, 2019; Umaadevi and Rekha, 2019). Kiewra (1991) claimed that note taking is important as it increases students' attention during lesson and enables coding the things taught during lesson into long-term memory. It was concluded in a study conducted by Faber et al. (2000) that note taking was effective in ninth graders' comprehending low-interest passages. Note taking can help students to recall some details about the subjects taught and to specialize in listening (Roy et al., 2014) as well as improving writing skill of an individual through different methods and techniques (Walker et al., 2017). Note taking is among the most crucial tools that improve comprehension (Kobayashi, 2005). However, comprehension is not only dependent on note taking. The primary thing to be successful is related to students' reviewing their notes (Van Matre and Carter, 1975).

Note taking is generally regarded within the context of courses. Notes taken during lessons mostly provide students with course materials and help them study their exams using these notes (Witherby and Tauber, 2019). Note taking is not only associated with courses. Notes are taken with the aim of a deeper understanding, long-term learning and reviewing previous knowledge as well, and note taking is applied in various fields of life such as daily life and professional life. For instance, a person's keeping clear and right records for his or others' use facilitates producing ideas and participating in the meeting. Notes which provide records in hospitals to be used as a reference in patient care and long-lasting treatments can be used in courts for referring later and can sustain reliability of judicial system (Mueller and Oppenheimer, 2016).

### **Effective note-taking**

Although students are taught various techniques to comprehend and to write texts during their school life, it is

understood that only few students get the skill of basic note taking. Even though students are asked to take notes comprehensively year-round, and it is known that note taking is useful for learning, keeping knowledge taught and thinking, the case is like that (Boch and Piolat, 2005). Although they complete a great number of notebooks, few students have the knowledge of note taking and reviewing (Kiewra, 1987). Reasons of this matter should be worked through. Is not instruction enough, or cannot note taking be taught functionally? Students' mislearning note taking causes them to be insufficient in effective note-taking. Some students perceive note taking as writing everything they hear. In a study carried out by Sutherland et al. (2002) with 25 students whose mother tongue was English or who learnt English as a foreign language, it was found that 17 students did verbatim transcription. If every word that is heard is noted, knowledge cannot be synthesized. Since working memory of a student who writes everything that is told or read is active, he/she cannot analyze the incoming knowledge (Hill and Miller, 2006).

### **Note taking instruction**

Speaking speed, comprehension speed and writing speed should be mentioned for note taking. Comprehension speed is more than speaking speed, and speaking speed is more than writing speed. Each word spoken can be understood, yet writing may be problematic. Therefore, trying to write everything a teacher tells may make note taking a skill that is too difficult to overcome. Students should be trained about note taking methods and techniques to prevent this. In some studies (Oğuz, 1999; Çetingöz, 2010), it was concluded that students having received training about note taking learned more than the ones that followed the lessons without training. There may be some students who do not know how to take notes effectively in the classrooms. Teachers are required to help those students to take notes and to encourage them to realize remarkable facts of a subject rather than to get angry (Bretzing et al., 1987; Murphy, 1996; Jacobs, 2013).

### **Individual differences**

Another matter to be touched on about note taking is the fact that students who take notes use different methods and techniques, or each student has a unique note taking style. Even the contractions that students use for the same word may be different from each other's. This is both surprising and closely related to students' individual differences (Hadwin et al., 1999; Piolat et al., 2005). Being cognitively different may result in students' adopting different note taking strategies and their getting different efficiency (Bui and Myerson, 2014; Jansen et al., 2017). It is quite normal that students take notes



differently and use different contractions. Students' previous learning may directly affect the notes they take about the topics they read or listen. Taking notes about information firstly met by regarding it important and disregarding information previously met and learnt completely are products of prior learnings. Prior learnings being complete or incomplete or null related to the same topic shows only one side of individual differences.

### Note taking and technology

There have been some changes in students' note taking styles with the developments in technology. Today, students can take notes through some programs installed in computers or mobile phones instead of through notebook and pencil. Even students who take a photo of the writings on the board (in other words take notes) are frequently seen (Özçakmak and Sarigöz, 2019). This proves that note taking keep up with changing technology and it still keeps its popularity. Technological advancements have provided students some conveniences and have lessened amount of time they spent for writing. Students who get accustomed to typing through keyboard rather than using pencil and notebook are able to write the same words in a shorter time and to focus on their courses in remaining time.

### Note taking during listening/reading

When note taking is considered, writing based on the things listened or read comes to mind. Such that, in the study carried out by Özçakmak and Sarigöz (2019) with university students, it was revealed that the students mostly regarded note taking as "note taking from listening" (61%), and it was followed by "note taking from reading" (31%). Notes generally used in academic learning can be taken from a course or a written document. Notes that are mostly taken under a deadline of time during a lesson can be written on intended speed while being taken from a written document (Olive and Barbier, 2017). Taking notes during listening or reading is regarded as a useful strategy in terms of developing storage of information (Carrier and Titus, 1979). When it is regarded in terms of linguistic skills, it forms a basis for improving listening, reading, speaking and writing skills. It is not possible for a student to tell a matter without understanding it. When this is taken into consideration, the importance of reading and listening skills appear by itself. In our study it was investigated how *reading and note taking during reading* and *listening and note taking during listening* affected students' comprehension success. Furthermore, note taking during reading and note taking during listening which are two components of note taking were compared with regard to their effect on the students' comprehension success. When the literature was searched, no studies were found revealing which of

the skills that were note taking during reading and note taking during listening was more effective.

### Aim of the study

In the study, it was aimed to determine possible impact of note taking during reading and listening on Turkish Language prospective teachers' comprehension success. Sub-problems of the study are as follows:

- 1). Are there any statistically significant differences between comprehension scores of the Reading Group (RG) and of the Listening Group (LG)?
- 2). Are there any statistically significant differences between comprehension scores of the Reading Group (RG) and of the Reading-Note Taking Group (RNTG)?
- 3). Are there any statistically significant differences between comprehension scores of the Listening Group (LG) and of the Listening-Note Taking Group (LNTG)?
- 4). Are there any statistically significant differences between comprehension scores of the Reading-Note Taking Group (RNTG) and of the Listening-Note Taking Group (LNTG)?
- 5). Is there any statistically significant relationship between comprehension scores of the groups and their academic achievement mean scores?
- 6). Are there any statistically significant differences between comprehension scores of the groups by gender?

## METHODOLOGY

### Model

In the study, causal-comparative research model was employed. This is a model that is used to investigate reason or result of a difference existing between groups or to reveal the effect of an independent variable on another dependent variable (Brewer and Kuhn, 2010; Fraenkel et al., 2011). In this model, it is aimed to compare situations in their natural environments without any interventions (Karasar, 2016). The aim of the researcher is to find if there were any effects of the independent variable on the dependent variable.

### Study group

The study was conducted with 72 second graders studying at the Department of Turkish Language Teaching at Education Faculty of Hatay Mustafa Kemal University. The students' ages ranged from 18 to 21. The students were randomly assigned to the groups considering A and B classes. The students' distributions by their academic achievement levels and by their genders are shown in Table 1.

### Data collection tool

#### **Comprehension achievement test**

The comprehension achievement test was employed in the study to determine reading and listening comprehension achievement

**Table 1.** Distribution of demographic information of the study group.

Variable		N	%
Groups	Reading	17	23.6
	Reading-Note Taking	18	25.0
	Listening	18	25.0
	Listening-Note Taking	19	26.4
	Total	72	100.0
Academic Achievement (GPA)	Low (Less than 2.75)	24	33.3
	Medium (Between 2.75-3.00)	19	26.4
	High (Greater than 3.00)	29	40.3
	Total	72	100.0
Gender	Female	52	72.2
	Male	20	27.8
	Total	72	100.0

scores of the students. The test consisted of 10 questions 5 of which were open-ended and 5 of which were true-false questions. One person who was experienced in assessment and evaluation gave support for preparation of the test. Each open-ended question of the Comprehension Achievement Test was 15 points and the maximum score to be taken from these open-ended questions was 75. Each of the other 5 questions which were true-false questions was 5 points, and the maximum score to be received from these 5 questions was 25. Thus, the maximum score to be received from the whole Comprehension Achievement Test was 100.

### **Reliability and validity**

The questions having been prepared within the context of Comprehension Achievement Test were conducted on 5 students before the implementation. By looking at the students' responses, they understood the questions accurately, and there were not any questions that they did not understand. This is important to assure that there no meaning is lost. Coherence between the evaluators was searched to provide reliability. For that purpose, the students' responses having been analyzed by the researcher were also evaluated by a Turkish language education expert. Coherence between the coders was found as 0.91 according to Miles and Huberman (1994) formula.

In order to ensure validity, the test included an informative text named "Childhood of the Famous Scientists". In this regard, the titles of "Albert Einstein", "Thomas Edison", "Alexander Graham Bell" and "Isaac Newton" were included in the open-ended (5 questions) and true-false questions (5 questions) of the test to ensure content validity. An expert of assessment and evaluation was consulted to make sure that the questions had content validity, and it was assured by the expert.

### **Process**

#### **Selection of the students**

The study was carried out with 72 university students who agreed to participate in the study voluntarily among 88 students studying at the Department of Turkish language teaching. The classroom variable affected assignment of students to the groups. Thus, that

which student would be in which group was not considered, but that students in which classroom would be in which group was taken into consideration. As a result of lot, class-A which included 35 students was selected for reading skills, and class-B which consisted of 37 students was selected for listening skills. With drawing the second lot, 17 students were assigned to the Reading group, and 18 students were assigned to the Reading-Note Taking group in class-A. Likewise, 18 students were assigned to the Listening group, and 19 students were assigned to the Listening-Note Taking group in class-B.

#### **Selection of the text**

In the study, an informative text of medium difficulty containing 640 words and 7 paragraphs and named as "Childhoods of the Famous Scientists" was used. The same text was used in all phases of the implementation. Supposing that the students' note taking and comprehension achievements would be affected positively by a text they met before the implementation, a text they had never met before was selected. The texts were intended to include information that most of the students did not know by asking for expert's opinion. Consequently, the informative text which was about childhoods of the famous scientists was selected among 10 candidate texts. The informative text mentioned about childhood years of the four scientists, Albert Einstein, Thomas Edison, Alexander Graham Bell and Isaac Newton.

#### **Implementation**

Certain facts were paid attention to in order to provide reliability and validity of the data obtained from the study before the implementation. Firstly, it was investigated whether the groups were equal or not, and the implementation started after enabling equality. Academic averages reflected general averages of the students for all the courses they received in the first and second grade. Means related to academic achievements of the groups are presented in Table 2.

When Table 2 is analyzed, it can be seen that mean in the reading group was 2.81, in the reading-note taking group was 2.93, in the listening group was 3.01, and in the listening-note taking group was 2.93. Grade point average was 2.92 in total. ANOVA test

**Table 2.** Groups' academic achievement distributions.

Groups	N	Mean	Std. deviation
Reading	17	2.81	0.40517
Reading-Note Taking	18	2.93	0.24583
Listening	18	3.01	0.27030
Listening - Note Taking	19	2.93	0.44984
Total	72	2.92	0.35368

**Table 3.** ANOVA analysis regarding academic achievements of the groups.

Groups	Sum of squares	df	Mean square	F	P
Between Groups	0.343	3	0.114	0.911	0.441
Within Groups	8.539	68	0.126		
Total	8.882	71			

was employed to determine if academic means caused any significant differences between the groups. Findings regarding ANOVA Test are illustrated in Table 3. It was understood from Table 3 that as a result of ANOVA test, there were not any significant differences between the groups ( $p > 0.05$ ). Thus, it was concluded that the reading group, the reading-note taking group, the listening group and the listening-note taking group were academically equal. Before implementation, the texts were selected meticulously in order to ensure that students were at an equal distance to the texts. Text selection was made among the texts that the students (at least most of them) had not seen before. The text which was selected under the guidance of an expert was asked to the students after the implementation, and it was questioned if the students had seen it before. Then, it was revealed that 65 of them (90.3%) had never seen it before, and the rest of them knew some of this information. Additionally, similarity of group distribution of the students knowing the information partially increased validity of the study. The students were assigned to the groups by lot before the implementation. 17 students of class-A consisting of 35 students were assigned to the *Reading* group, and the rest 18 were assigned to the *Reading-Note Taking* group. Moreover, 18 students of class-B consisting of 37 students were assigned to the *Listening* group, and the rest 19 were assigned to the *Listening-Note Taking* group. The students were informed about the implementation before the intervention, and the student groups which were determined by lot were gathered. The implementation started with class-A in which *Reading* and *Reading-Note Taking* groups were included. The students in the *Reading* group were asked not to use pencil and sheet, while the students in the *Reading-Note Taking* were informed that they could take notes during reading. Then, the informative text, "Childhoods of the Famous Scientists", which consisted of 640 words was handed out to the groups of *Reading* and *Reading-Note Taking*. The implementation lasted for 40 min. While the students in the *Reading* group gave back the texts they read without taking notes, the students in the *Reading-Note Taking* group gave back the texts on which they took some notes.

On another day, implementation was performed in class-B in which the groups of *Listening* and *Listening-Note Taking* were included. The students were informed about the implementation before the intervention, and they were told about the group they would be in. They clustered based on their groups. Then, the students were asked to listen to the informative text, "Childhoods of the Famous Scientists", which consisted of 640 words. The

students in the *Listening* group were asked not to use pencil and sheet, while the students in the *Listening-Note Taking* were informed that they could take notes during listening. The implementation lasted for 40 min. The notes taken by the students in the *Listening-Note Taking* group were collected.

#### Data analysis

The data of the study were analyzed using IBM SPSS Statistics 20 package program. Some measurements had been made before the analysis to determine the types of analyses to be used (parametric or non-parametric). As a result of Levene's Test, it was found that variances were equal ( $p > 0.05$ ). Moreover, it was understood as a result of Shapiro Wilk Test that the data showed normal distribution ( $p > 0.05$ ). Thus, parametric measurements were applied. In the study, some descriptive statistics including percentage, frequency, mean and standard deviation were employed. Furthermore, Independent Sample T-Test, ANOVA Test, Post Hoc Benferroni Test and Pearson Correlation Test were used. The findings obtained as a result of the analysis are presented in tables in the section of "Findings".

#### FINDINGS

In the section of findings, descriptive statistical tables related to the groups were presented, and the analyses showing whether there were significant differences between the groups and if the groups differentiated by gender were shown in tables. In addition, an analysis was performed to test if there was a correlational relation between comprehension achievement scores and academic point averages of the groups.

Table 4 shows mean scores which the groups received from the Comprehension Achievement Test. It can be seen in the table that the Listening-Note Taking group received the highest score ( $\bar{X} = 81.05$ ) while the Reading group received the lowest score ( $\bar{X} = 59.41$ ). The average

**Table 4.** Distribution of comprehension achievement means of the groups.

Groups	N	Mean	Std. deviation
Reading	17	59.41	15.39910
Reading-Note Taking	18	66.94	9.72246
Listening	18	65.28	10.77473
Listening - Note Taking	19	81.05	9.65789
Total	72	68.47	13.88177

**Table 5.** Anova analysis regarding comprehension achievements of the groups.

Source	Sum of squares	df	Mean Square	F	Sig.
Between Groups	4628.324	3	1542.775	11.587	0.000
Within Groups	9053.621	68	133.141		
Total	13681.944	71			

**Table 6.** Post Hoc Benferroni test results regarding comprehension achievements of the groups.

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.
Reading	Reading-Note Taking	-7.53268	3.90238	0.346
	Listening	-5.86601	3.90238	0.825
	Listening - Note Taking	-21.64087 <sup>*</sup>	3.85218	0.000
Reading-Note Taking	Listening	1.66667	3.84623	1.000
	Listening - Note Taking	-14.10819 <sup>*</sup>	3.79529	0.002
Listening	Listening - Note Taking	-15.77485 <sup>*</sup>	3.79529	0.001

comprehension achievement score for all of the groups was 68.47. ANOVA was employed to see if the scores that the groups received from the Comprehension Achievement Test were statistically significant or not, and the findings are shown in Table 5.

Table 5 indicated that there was a significant difference between mean scores that the groups received from the Comprehension Achievement Test ( $p < 0.01$ ). The findings of Post Hoc Benferroni Test used to understand between which groups the difference was and in favor of which groups are presented in Table 6. As it can be seen in Table 6, there was a significant difference between the Reading and the Listening-Note Taking groups (in favor of the latter one) ( $p < 0.01$ ), between the Reading-Note Taking and the Listening-Note Taking groups (in favor of the latter one) ( $p < 0.01$ ) and between the Listening and the Listening-Note Taking groups (in favor of the latter one) ( $p < 0.01$ ). In other words, scores that the students who took notes during listening received from the Comprehension Achievement Test were higher than scores of the students who just read and took the exam,

than scores of the ones who took the exam after taking notes during reading and scores of the ones who just listened and took the exam. Before conducting an analysis about testing if there was a relation between the students' academic grade points and their comprehension achievement scores, their academic grade point averages and comprehension achievement scores are shown in Table 7.

Table 7 illustrates the students' comprehension scores and their academic grade point averages. According to the table, the mean score that the students received from the Comprehension Achievement Test was 68.47, while their academic grade point averages were 2,92 out of 4,00. The results of Pearson correlation analysis employed to determine if there was a relation between the students' comprehension scores and their academic grade point averages are presented in Table 8.

Table 8 indicated that there was a positive-way relation (even if it was weak) between the students' comprehension scores and their academic grade point averages ( $p < 0.05$ ). This finding revealed that there was a

**Table 7.** Descriptive statistics regarding academic point averages and comprehension achievement scores.

Variable	Mean	Std. deviation	N
Comprehension achievement score	68.47	13.88177	72
Academic grade point average	2.92	0.35368	72

**Table 8.** Correlation between academic grade point averages and comprehension achievement scores.

		Comprehension achievement score	Academic grade point average
Comprehension achievement score	Pearson correlation	1	0.264 <sup>*</sup>
	p		0.025
	N	72	72

**Table 9.** Analysis of the students' comprehension scores by the variable of gender (Independent Sample T-Test).

	Gender	N	Mean	Std. Deviation	t	df	Sig.
Comprehension achievement score	Female	52	70.38	13.85662	1.920	70	0.059
	Male	20	63.50	12.98785			

linear proportion between academic grade point averages and comprehension scores. In other words, it showed that students with high academic grade points can get higher scores from the Comprehension Achievement Test. Since distributions of the students to the groups varied in terms of gender, analysis regarding gender was made considering comprehension achievement scores of the all groups. Distributions of the students' comprehension achievement scores by gender are expressed in Table 9.

According to Table 9, when the scores that the students received from the Comprehension Achievement Test were analyzed, although the female students' scores ( $\bar{X}=70.38$ ) were higher than the male students' scores ( $\bar{X}=63.50$ ), Independent Sample T-Test results showed that no statistically significant differences were found between female and male students ( $p>0.05$ ).

## DISCUSSION

In the study, note taking during reading and note taking during listening which are two components of note taking skill were handled. A great number of studies related to note taking during reading (Faber et al., 2000; Badger et al., 2001; Hebert et al., 2014; Chang and Ku, 2015) and note taking during listening (Çetingöz, 2010; Ahour and Bargool, 2015; Zuckerman, 2016; Park, 2019) have been carried out. However, that no studies were found revealing which of the skills that were note taking during

reading and note taking during listening was more effective made this study important.

In this study, impact of reading and listening skills as sub-components of note taking on students' comprehension achievement was investigated as well, and it was found that there were not any differences between comprehension achievement scores of the *Reading* and *Listening* groups. This finding can be interpreted as that reading and listening skills are not superior to each other, and students' reading or listening to any informative materials affect their comprehension levels in a similar way. Some students can learn better by listening while others can learn better by reading even though none of these two skills is superior to the other. This is closely related to the students' learning styles.

The fact that the *Reading* and *Reading-Note Taking* groups were similar in terms of their comprehension achievements asserted that students' reading a text and their taking notes after reading this text did not affect their comprehension. However, this result was found to be controversial with some other studies (Faber et al., 2000; Belet, 2005; Tok and Beyazit, 2007). Some factors such as the text's being informative and not being too long (640 words), and its being interesting as it was about childhood years of the famous scientists may have caused comprehension achievement scores of the *Reading* and *Reading-Note Taking* groups to be close. When it was considered with regard to the *Listening* and *Listening-Note Taking* groups, it was seen that note taking during listening affected the students'

comprehension achievement levels positively. There are a lot of studies supporting this finding (Durukan and Maden, 2010; Kocaadam, 2011; Ceran, 2015). The result obtained in our study should be considered based on the informative text used. Taking notes during listening may not always be more advantageous than listening without taking notes. For instance, the case may be exact opposite in a study in which a narrative text is used and students' success of note taking during listening and of listening without note taking is compared.

When the results obtained in our study were considered with regard to *Reading-Note Taking* and *Listening-Note Taking*, it was revealed that note taking during listening affected comprehension achievement more compared to note taking during reading. The reason may be the fact that taking notes while listening to a lesson has certain advantages compared to taking notes while reading a material. While note taking during listening is simultaneous with the text, note taking during reading requires students to go between skills of reading and note taking (Kiewra, 1991). In other words, while note taking during listening is formed in one step, note taking during reading necessitates two steps. In a study carried out by Riley and Dyer (1979), a text containing 2.000 words was read by a group of participants while it was listened by another group of participants. Both groups were split into two groups within themselves as the group taking notes and the group not taking notes. As a result of that study, it was found that note taking provided some advantages for the listeners, yet it did not cause any differences for the readers.

In our study, it was found that there was a positive weak relation between the students' comprehension scores and their academic grade point averages. This proved that there was a linear proportion between the students' academic grade point averages and their comprehension scores. In other words, it was inferred that the possibility of receiving a high score from the Comprehension Achievement Test by the students who had high academic grade point averages was higher compared to the ones who had low academic grade point averages. In his doctoral thesis, Daly (1983) suggested that there was a high level of positive relation between general grade point average and note taking achievement. Similarly, in the studies conducted by Kiewra and Benton (1988) and Luo et al. (2016), it was found that amount of notes taken was closely related to academic achievement. Although these findings showed that note taking skill was highly dependent on academic achievement, academically low or mediocre students' note taking success can be improved with the help of well-structured note taking instruction. This is because of the fact that quality of the notes is important rather than amount of them regardless of the way they were taken (by listening or by reading). In other words, amount of the basic units of the text caught is more important than amount of the note taken. Otherwise, verbatim note taking would be invaluable.

When the scores that the students received from the Comprehension Achievement Test were analyzed, although the female students' scores ( $\bar{x}=70.38$ ) were higher than the male students' scores ( $\bar{x}=63.50$ ), Independent Sample T-Test results showed that no statistically significant differences were found between female and male students. In some studies, it was claimed that female students recorded more important ideas than the male students, yet they were less successful than the male students (Hartley, 1976; Daly, 1983). However, in many studies (Reddington et al., 2015; Morehead et al., 2019), it was revealed that females took notes more effectively than males. On the other hand, there are also some studies (Rahmani and Sadeghi, 2011; White, 2017) suggesting that there are no significant differences between female and male students with regard to note taking success.

### Limitations

In our study, an informative text was used. It is possible to obtain different results by using narrative or argumentative texts. Furthermore, length of the text used in the study was 640 words. Conducting the study with longer or shorter texts may result in different findings.

### Implications

Our study which was carried out by using an informative text is not generalizable for other types of texts. Therefore, different academic studies can be conducted on the impact of note taking on narrative and argumentative texts in terms of note taking during reading and note taking during listening. In the current study, an informative text containing 640 words and 7 paragraphs was employed. In further studies, the possible effect of the text length on note taking and on comprehension achievement can be investigated.

In the current study, university students were selected as the sample. In further studies, different samples such as primary school, middle school and high school can be chosen. Additionally, impact of note taking styles (reading and listening) on comprehension achievement can be investigated in the field of teaching language to the foreigners.

### CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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*Full Length Research Paper*

# **Evaluating endodontic dental education by clinical errors (iatrogenic perforations) made by students in their last year of education**

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**The aim of this study was to evaluate the technical procedural iatrogenic errors, especially to determine the frequency of dental perforation made by undergraduate students in Sofia, Faculty of Dentistry, Bulgaria, in the school years of 2014/2015 and 2015/2016. The assessment was by examination of periapical radiographs of completed endodontically treated teeth, performed by last year dental students. A total of 748 teeth were evaluated and 30 perforations were found. From 285 treated in 2015, 10 perforations were found. From 493 teeth treated in 2016, 20 perforations were found. The overall frequency of perforations was 3.9% for 2015 and 4.1% for 2016. The frequency of perforations made by postgraduate Bulgarian students established by us is low and it is similar to that made by general practitioners and found by other Bulgarian researches. Perforation frequency found in this study is due to the large number of retreatments (36% of all cases) and the prevailing number of elderly patients with calcified canals that come to be treated in our facility. And yet it is not significantly different from other published data.**

**Key words:** Dental education, iatrogenic perforations, quality of root canal treatment.

## **INTRODUCTION**

The technical quality of root canal treatment (RCT) has an impact on its outcome, and consequently, in maintaining the functionality of the tooth. Endodontic treatment, like other complex dental procedures, is associated with the risk of occurrence of unexpected complications affecting the treatment prognosis. Iatrogenic errors can be classified according to the stage of endodontic treatment, and they occur as follows:

during access cavity preparation; during root canal instrumentation (ledge, root perforation, root transportation, fractured instrument); during root canal obturation (inadequate root canal filling length or density, vertical root fracture); and other accidents during root canal treatment (aspiration or ingestion, extrusion of irrigant, emphysema) (Lambrianidis, 2001).

One reason for endodontic failure is the perforation.

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This situation is characterized by a communication between the root canal system and the external tooth surface (American Association of Endodontists, 2016). It can be caused by a pathological process (dental caries, root resorption) or an operative procedural accident. Pathological perforations are found in routine clinical exams, whereas iatrogenic root perforations may occur during routine endodontic treatment (Torabinejad et al., 2018; Seltzer et al., 1970; Camilo do Carmo Monteiro et al., 2017; Rotstein, 2017; de Sousa Reis et al., 2019; Fuss and Trope, 1996; Roda, 2001; Krupp et al., 2013; Roda and Gettleman, 2016). The frequency of root perforations has been reported to range from 3% to as high as 10% (Seltzer et al., 1970; Fuss and Trope, 1996; Eleftheriadis and Lambrianidis, 2005).

Different types of root perforation (including furcation perforation, strip perforation, and apical perforation) and extrusion of the root filling materials can be detected in any area along the root. The technical quality of root canal treatments and the prevalence of associated iatrogenic errors performed in dental schools have been studied on the basis of radiographic criteria (Lambrianidis, 2001). Clinical skills play an important role in the treatment outcome. Dental students do not have proficiency and must acquire the necessary skills by exercising over time. Thus, procedural errors have a higher frequency among them.

No reports on the technical quality of root canal fillings performed by Bulgarian undergraduate dental students have been published. However, a single epidemiologic study had been performed on the technical quality of root canal fillings in Bulgarian population (Vangelov et al., 2008) and results showed good filling quality only in 29.6% of the cases.

Stamatova and Vladimirov (2004), who are investigating the frequency of perforations by general dentists through questionnaires, also found that perforations are relatively rare complications, less than 5 cases a year for a dentist. According to Kuzmanova, who researched 2460 clinical cases with endodontic treatment, the average frequency of iatrogenic perforations, made by general Bulgarian dentists is 4.06% (Kuzmanova, 2018).

The aim of this study was to determine the frequency of dental perforation made by undergraduate students in Sofia, Faculty of Dentistry, Bulgaria, in the school years of 2014/2015 and 2015/2016.

## METHODOLOGY

Dental students at Sofia Medical University undertake a full preclinical course in the second and third year of their six-year training. The clinical course in the fourth and fifth year is 4 terms; it includes 30 h of theoretical lectures each year and 5 h of weekly clinical exercises during which students treat single and multi-rooted teeth.

Students performing endodontic treatments in the dental training clinic have to get every step approved by an assistant professor before proceeding to the next step. Most of the teachers supervising

endodontic treatments are specialized or specializing in endodontics.

In the sixth year, endodontic treatments are performed as part of a comprehensive dentistry-care course under the supervision of specialists, but they do not get to supervise each and every step of the process.

Radiographic evaluation is a common method for assessing the technical quality of RCT (Hansrani, 2015; Tsuneishi et al., 2005).

The data were collected from patient records and a total of 912 teeth were first included in the study. In all of these cases, RCT was performed by undergraduate dental students at Medical University, Faculty of Dental Medicine, Sofia, during the academic years 2015 and 2016. All cases with incomplete patient information, that is, missing or poor quality radiographs were excluded; the causes for exclusion were summarized. The final data comprised 778 teeth, 285 from 2015 and 493 from 2016. Conventional intraoral radiographic pictures were taken at the beginning of the treatment, during the treatment, after canal obturation, and after post-placement if the post was needed. Radiographs exhibiting superimposition of tooth structure on root canal obturation and anatomical structures were excluded from the study sample to ensure that there was no confusion in radiographic interpretation. Radiographic criteria for quality of RCT were established in accordance with the European guidelines and previous studies on the outcome of RCT performed by dental undergraduates (Eleftheriadis and Lambrianidis, 2005; Khabbaz et al., 2010).

Informed consent forms were signed by all the patients. The study was approved by the Ethics Commission for Research at the Medical University of Sofia (KENIUMUS).

All radiographs were examined independently by two researchers with more than 7 years of experience with the aid of a double-magnifying glass. Afterward, the results were compared and the researchers came to a consensus. The two examiners were calibrated beforehand after performing an experiment. Kappa values for interexaminers and intraexaminer reproducibility was approximately 80 to 90.

## Statistical analysis

The data were described as frequencies and proportions as well as graphically. Cross-tabulation was used to investigate the association between the groups. The differences between the groups were tested using Z-test with Bonferroni correction, the differences between the groups were considered statistically significant when the p-value was less than 0.05. All statistical analyses were performed using SPSS 22.0 for Windows (Chicago, IL, USA).

## RESULTS

During the years 2015-2016, a total of 1108 root canal fillings were performed by 6th year dental students in the Faculty of Dentistry in Sofia. The data were collected from patient records and a total of 912 teeth were first included in the study. The final data comprised 778 teeth, 285 from 2015 and 493 from 2016.

748 teeth were evaluated and 30 perforations were found. From 285 treated in 2015, 10 perforations were found. From 493 teeth treated in 2016, 20 perforations were found. The overall frequency of perforations was 3.9% for 2015 and 4.1% for 2016. Results are summarized in Tables 1 and 2 .

**Table 1.** Total frequency of dental perforation made by undergraduate students for the period of the research.

Variable			Year		Total
			2015	2016	
Perforation	0	Count	275	473	748
		%	35.3	60.8	96.1
	1	Count	10	20	30
		%	1.3	2.6	3.9
Total	Count	285	493	778	
	% from total	36.6	63.4	100.0	

**Table 2.** Frequency of dental perforation made in 2015 and 2016

Variable			Year		Total
			2015	2016	
Perforation	0	Count	275	473	748
		%	96.5	95.9	96.1
	1	Count	10	20	30
		%	3.5	4.1	3.9
Total	Count	285	493	778	
	%	-	-	100.0	

**Table 3.** Distribution of clinical cases by type of tooth for 2015.

2015	Type of the tooth						Total	
		1	2	3	4	5		6
Total	Count	68	29	51	42	50	45	285
	%	23.9	10.2	17.9	14.7	17.5	15.8	100.0

Table 1 shows that 285 teeth treated in 2015 represent 36.6% from all 778 teeth, 493 teeth treated in 2016 represent 63.4% of the research sample. From these teeth, 748 or 96.1% from all teeth do not have perforations (code 0). In 30 teeth or 3.9%, there is a perforation (code 1).

Table 2 shows that the overall frequency of perforations for 2015 was 3.5% from all 285 teeth treated in that year. For 2016, 4.1% of all teeth treated in that year had perforations.

For 2015 the included cases involved treatments of 68 maxillary canines and incisors (23.9%); 29 mandibular canines and incisors (10.2%); 51 maxillary premolars (17.9%); 42 mandibular premolars (14.7%); 50 maxillary molars (17.5%), and 45 mandibular molars (15.8%) (Table 3).

For 2016, the included cases involved treatments of 132 maxillary canines and incisors (26.8%); 38 mandibular canines and incisors (7.7%); 88 maxillary premolars (17.8%); 94 mandibular premolars (19.1%); 64 maxillary molars (13.0%) and 77 mandibular molars (15.6%) (Table 4).

## DISCUSSION

Root canal therapy is a complex procedure. It requires competent technical skills and experience, as well as an understanding of pulp anatomy and its variations. Knowledge of root canal morphology and pulp chamber will allow the student to avoid any mishaps. Knowledge of possible errors is of great importance for the academic

**Table 4.** Distribution of clinical cases by type of tooth for 2016.

2016		Type of the tooth						Total
		1	2	3	4	5	6	
Total	Count	132	38	88	94	64	77	493
	%	26.8	7.7	17.8	19.1	13.0	15.6	100.0

teachers in order to avoid failure. The transition from the pre-clinical to clinical course might be very stressful and problematic for many students. It is of utmost importance that students achieve a certain level of competence over the course of their education through preclinical and clinical courses.

In previous studies, the prevalence of iatrogenic root perforations was found to range between 2.7 and 10% (Torabinejad et al., 2018; Eleftheriadis and Lambrianidis, 2005; Farzaneh et al., 2004; Ingle, 1961; Kerekes and Tronstad, 1979; Seltzer et al., 1967; Jitaru et al., 2016). In the present study, we found perforation in 3.9% of endodontically treated teeth which is comparable with results from other studies. Perforation frequency found in our study is due to the large number of retreatments (36% of all cases) and the prevailing number of elderly patients with calcified canals that come to be treated in our facility.

In their study of the outcome of endodontic treatments by dental students, Rapo et al. (2017) evaluated the quality of the root canal treatments performed by undergraduate dental students. Data comprised 105 teeth analyzed by digital radiographs. They found 3.8% (4 teeth, 3 of them in the lower jaw) of teeth had lateral perforation as a complication. In our study perforations occurred in 3.5% of all examined teeth in 2015 and in 4.1% of the teeth in 2016.

That is comparable to the results found by Mukhaimer (2013). In his study, a total of 612 periapical radiographs were used to assess the radiographic technical quality of 1013 root canals performed by the 4 and 5th undergraduate students between the years 2009 and 2012. Root perforation was detected in 47 of the 1013 canals (4.6%).

Farzaneh et al. (2004) assessed the 4- to 6-year outcome of orthograde retreatment for Phases I and II of the Torontos. In total, 523 teeth in 444 patients were re-treated. With 395 teeth lost to follow-up and 25 extracted 103 teeth (34% recall). Supervised graduate students provided treatment in accordance with a structured protocol. Presence of perforations in their study sample was 12%, but the sample included only retreatments, which explains the higher rate. In our study, primary treatment as well as retreatment cases were included.

For an optimal clinical endodontic work, updated knowledge, good training, and use of best technology are needed. It was reported in a previous study that most of the undergraduate students were not confident of

carrying out RCT of molar teeth and felt they needed extended training in the same (Moussa-Badran et al., 2008). Akhtar et al. (2016) reported strip perforation (5%), apical perforation (5%) and perforation during access (3%) in 200 root canal treatment in the permanent first molar performed by interns. So a total of 13% of cases had perforations but the case sample consisted only of permanent molars. In our study, perforations were found in 3.9% of endodontically treated teeth but our case sample consisted of all kinds of teeth: incisors and canines, premolars, first, second and third molars. Treating permanent molars can be challenging and may explain the higher rate of perforations.

Haji-Hassani et al. (2015) studied a total number of 1335 charts of the cases in the field of root canal treatment. The second most frequent error was overfilling (apical perforation) in 18.2%. They found 0.9 strip perforations and no case of furcal perforation. According to the authors, the lack of furcal perforations was due to perfect supervision. Khabbaz et al. (2010) also did not find any furcal perforations, but they reported root and apical foramen perforation in 11.8 and 32.6% of the canals, respectively. In our program, sixth-year students were supervised by 2 endodontic specialists. In 2015, there were 100 students and in 2016 there were 144 students. The ratio of supervisors: students was 1:50 in 2015 and 1: 72 in 2016. This ratio should be improved so that more careful supervision can be obtained.

The quality of education is a resultant of many factors such as time devoted to theoretical and practical teaching and training (pre-clinical and clinical), the ratio of supervisors: students, the clinical and scientific level of teachers if they are specialized or not, the teaching aids, the assessment methods, etc. Some complications can be avoided using modern technologies introduced to endodontics. However, the treatment choice depends likewise on dental equipment, skills, and knowledge, amount of tooth structure left, patient's willingness to follow the instructions, desire and economic status of the individual (Estrela et al., 2014; Unal et al., 2011).

## Conclusion

The frequency of perforations made by undergraduate Bulgarian students established by us is low and it is similar to that made by general practitioners and found by other Bulgarian researches. Perforation frequency found

in our study is due to a large number of retreatments (36% of all cases) and the prevailing number of elderly patients with calcified canals that come to be treated in our facility. And yet it is not significantly different from other published data.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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