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## Safety in Mechanical Technology Workshops at South African Public Schools

### Abstract

South Africa has an urgent need for qualified technical and mechanical people. Technical disciplines are encouraged in public schools to fulfil this requirement. Teachers are also in an environment that is becoming increasingly litigious. Technology teachers may be forced to pay greater attention to managing safety and security as legal liability for harm caused during activities in school workshops is expected to increase. The safety of all students is a crucial component in schools. Effective teaching and learning can be improved in workshop areas where learner safety, or “Geborgenheit”, is generated. The security of students while they participate in activities is the responsibility of the Mechanical Technology teacher. For school workshops, an efficient safety policy must be created to reduce the danger of injuries and harm to students. The primary method for reducing and preventing injuries and making sure that the teacher or school is not held accountable for damage, is a purposeful policy. The empirical investigation used a mixed research methodology, where Mechanical Technology teachers quantitatively and qualitatively assessed the management of security in school workshops. Data were triangulated (analytically, narratively, and discussed), and conclusions and suggestions were formed. The results show that teachers are unaware of their legal obligation to take care of students and are under-informed on delictual liability and education law. Due to the complexity of today’s society, all participants in the education industry must recognize that understanding the legal and technological facets of the field is not only important, but also ought to be made essential.

Keywords: Mechanical Technology, safety, workshops, public schools, education legal perspective

### Introduction and problem statement

Schools have workshops, laboratories, and sports fields which, according to Oosthuizen (2022, p. 6) make these areas in schools potentially dangerous due to the activities that take place there. One of the tasks of schools and governing bodies according to Article 20(1)(e) of the South African Schools Act 84 of 1996 (RSA, 1996), is that special attention must be paid to the safety of learners and the prevention of injuries to learners in school workshops. Despite this prescription, many learners are still injured in school workshops (Smit, 2022, p. 1). Mechanical Technology is a school subject in the Senior and Further Education and Training (FET) phase, which includes a large part of teaching in practical workshops (DBE, 2014, p. 9). It is in these environments where the safety risks with the use of subject-specific machinery are very high (Smit, 2022, p. 5). Smit also mentions that teachers are responsible for managing and controlling technology workshops. Mechanical Technology teachers should therefore be aware of their legal obligations and responsibilities regarding the security

of learners in the workshops (Smit, 2022, p. 5). These risks place a legal duty on the teachers which means that they must ensure the safety of learners under their care, who work with dangerous machinery in these workshops (Oosthuizen, 2022, p. 6). With his study in South African schools, Oosthuizen (2011, p. 2) found that a high percentage of accidents with machinery occurred in school workshops.

## **State of the art**

### *Safe school environment*

According to Barnes (2010, p. 40), schools must be a safe learning environment for learners and teachers. Teachers must confidently practise their practice in a safe environment, and where learners can develop their latent abilities. Machelm (2015, p. 28) explains that learners who feel threatened or unsafe cannot be stimulated academically and that an unsupported educational environment can have a ripple and negative influence on the learners' academic success and also on their intellectual progress. Zengele (2013, pp. 29-30) refers to different aspects in a school environment which are decisive for the underpinning of the teaching-learning situation. One of the aspects is safe school infrastructure where a secured school infrastructure can let learners participate in school activities with confidence, without fear of injuries which can lead to better academic success. According to Oosthuizen (2015, p. 5), learners as adolescents have the need for subject knowledge and general basic skills that they can use as adults. Learners must therefore learn the necessary skills in a safe school environment and be able to apply them later in the adult world after their schooling.

### *Mechanical Technology*

The National Curriculum Statement defines Mechanical Technology and its applications in the school curriculum as follows (DBE, 2014, p. 9): Mechanical Technology focuses on concepts and principles in the mechanical (automotive, mining, shipping, rail, power, generation, etc.) environment and on the technological processes. It encompasses practical skills and the application of scientific principles. Mechanical Technology aims to create and improve the engineering and manufacturing environment and to ensure the sustainable use of the natural environment and resources. The Mechanical Technology workshop consists of three disciplines: Motor, Fitting and machine work and Welding and metalwork (DBE, 2014, pp. 8-10).

### *Workshops*

Adams, Mitchell and Nortier (2012, p. 2) explain that workshops are places where persons or learners are busy designing, making, manufacturing or repairing industrial tools, equipment and models. Onele (2014, p. 23) indicates that a workshop is the place where practical activities such as measuring, cutting, assembling of parts, repair work and finishing of products are carried out. Onele (2014, p. 23) states that the school workshop is the place where learners apply the practical part that they learned in the theoretical class. According to him, the workshop is also the storage place for machinery, tools, accessories and materials used for the practical component.

### *Public schools*

The South African Schools Act 84 of 1996 (RSA, 1996) established a national schooling system and recognised two categories of schools: public and independent.

Public schools are state-controlled and independent schools are privately governed. All private schools were included in the independent school category. Public schools depend on the government for funding and supplies and the standard of education varies from region to region (RSA, 1996).

### *Education law perspective*

The study was conducted from an education law perspective and endorses the principle of education law as an independent discipline as postulated by Oosthuizen et al. (2020, pp. 7-10). Education law plays a special role in creating a safe, secure school and classroom environment. Rules, regulations, fair procedures, and other legal measures are used to create security. Oosthuizen et al. (2020, pp. 7-10) explains that education law aims to regulate education in South Africa so that an environment of security can be created. The participants involved in this security environment are learners, parents, teachers, as well as the state. According to Oosthuizen et al. (2020, pp. 7-10), it is of great importance that all stakeholders in the educational environment realize the importance of security in the educational setting. Knowledge and understanding of education law according to Coetzee (2008, p. 184) are essential to bringing about a balance regarding the respective rights and duties of educational role players in the establishment of a protected learning environment that contributes to effective learning and teaching.

### **Research aim**

The primary research aim of the study is to establish the comprehensive understanding of the nature of the educational legal obligations of Mechanical Technology teachers in relation to safety management in the Mechanical Technology workshops.

### **Research design and method**

The research was carried out from a pragmatic paradigm design. In the empirical part of the investigation, mixed methods were used, where quantitative and qualitative research methods were combined in one investigation. For the quantitative research, a structured electronic questionnaire was developed. The quantitative study was supplemented with a phenomenological study during which individual semi-structured interviews were used as data collection method.

### *Population and regional sampling*

For the quantitative research, the teachers from 220 (N=220) technical schools in South Africa who offered Mechanical Technology as a subject during the study, were the target population of the study. For the qualitative study, a purposive sampling approach was followed, and the participants (N=8) were selected because of their expertise, skill and experience in schools; therefore, participants who could provide the richest information were selected.

### *Ethical aspects*

Approval for the study was obtained from the ethics committee of the university under whose supervision and care the research was carried out. All ethical directives as determined by this committee have been complied with.

### *Data analysis*

For the analysis and processing of the quantitative data, appropriate statistical techniques were chosen, and the data was processed by the statistical consulting service of a university. The interviews with the eight respondents were then recorded and the recordings were transcribed, after which various groups, categories, sub-themes and themes were identified. After the coding process was completed, the final data analysis was done and perceptions were compared and combined.

### **Findings**

Some of the combined findings from the quantitative and qualitative investigations were as follows:

#### *Ignorance*

Teachers believe that in today's society people are more aware of their rights, as evidenced by the court cases of the past number of years. Very few of the teachers show sufficient insight and understanding about the Constitution and how it relates to safety in the workshops. However, the teachers in the study realize that they themselves are in danger of being held liable if they violate learners' rights in any way in the workshops, and are therefore criminally liable for such violation of rights. In the light of this, the teachers realize their responsibility to ensure the safety of learners under their supervision and that they must be aware of the rights of the child so that they can create a safe workshop environment for the learners. Teachers are aware that they have an obligation to ensure the safety of learners under their supervision and control. The clear lack of knowledge about legislation that exists among the teachers who participated in the study, is a serious bottleneck for the teachers who have to prevent risks in the workshops and to fulfil their duty of care for the safety of the learners. Common law imposes certain obligations on school principals, teachers and governing bodies and grants them certain powers. The teachers stand in an *in loco parentis* position towards a learner. As a result of the *in loco parentis* role, the teachers get an obligation, as well as a power to take measures to ensure the safety of the learners. The teachers are aware that they have a duty of care towards the learners entrusted to their care in the workshops, but they are ignorant of the common law nature and content of the legal principles of the duty of care.

#### *Injuries*

Most of the teachers consider workshops to be a potentially dangerous place and that learners are exposed to accidents and injuries as a result of the activities they carry out in the workshops. In the quantitative study, only 11.88% of the respondents indicated that there were no injuries in their workshops. However, many of the injuries are minor injuries. Six respondents indicated that there were very serious injuries with machine tools, and only four respondents indicated that they also suffered very serious injuries with portable hand tools. There is a great deal of ignorance about the *de minimis non curat lex* principle, which means that the law does not consider trifles. This principle does not give teachers the right to ignore minor injuries, to talk them down or not to report them, but the principle should be reassuring, as the teachers are not held responsible or blamed for minor injuries. In the quantitative study, 5.8% of the respondents indicated that learners sustained minor injuries with specific fixed

machinery, while 14.42% sustained minor injuries with specific portable power tools. 24.32% of the respondents indicated that learners suffered minor injuries with certain hand tools. The teachers who participated in the qualitative study each referred to an incident or injury they had as a teacher in the workshop. Although more serious injuries do not occur frequently, serious injuries and very serious injuries do occur from time to time as evidenced by the interviews with the participants.

### *“Geborgenheit” (a loving-caring attitude) in a workshop environment*

The teachers are aware that the law requires a higher degree of careful supervision in the workshop towards learners based on their specialized knowledge and expertise. The teachers realize that there are consequences of negligent actions, but there are situations in practice where the teachers are expected to risk certain risks against their knowledge. In such cases where, for example, there are too many learners in the workshop, creates a situation that poses a risk of injury, and because there are no alternative circumstances, the teachers take the chance and use existing facilities in the hope that no injuries will happen. Damage is therefore foreseeable for the teachers, but some of them feel that they are not in a position to prevent it. However, from the study it appears that although a large number of teachers are not familiar with the legal theoretical nuances and legal technical details of delictual liability, there is indeed a sense of duty among them. Most of the participants can recognize dangerous situations in the workshops and realize that they must act preventively to prevent the learners from risking injuries.

### *Safety*

The teachers have a duty of care towards the learners and the teachers are expected to take and apply certain measures that will prevent risks and injuries in the workshop. The teacher’s duty of care entails, among other things, that he is held responsible for a safe workshop environment. Under Section 61 of the South African Schools Act 84 of 1996 (RSA, 1996), the Minister can make regulations under the Act to achieve important objectives of the South African Schools Act. Article 8A (2) of the regulations states that a public school must take the necessary measures to ensure the safety of the learners during any school activities and that learners, where possible, will always be under the supervision of a teacher. Workshop safety measures and learner discipline in the workshops must be well applied. Learners who stay within the limits of the workshop rules find themselves in a safe space in which they feel safe and secure and can therefore freely participate in the workshop activities. The findings of this study indicate that effective education can take place within a space of security.

### *Level of competence and experience of teachers*

The teachers were of the opinion that there is a definite connection between teachers’ levels of competence and the practical skill levels of that they must apply through teaching and learning. The participants confirm that expertise is essential for meaningful teaching and learning. Some of the teachers consider themselves experts in their subject area based on their good training and practical experience. The participants agree that a teacher is considered as a reasonable expert based on his training, and that expertise is the foundation of high-quality teaching and learning. As a result of the specialized knowledge and experience of the teachers, the safety of the

learners is ensured to a large extent and optimal skill development of the learners can take place if there is security in the workshops.

## Conclusion

It became clear from the study that there are legitimate gaps in safety policy and practice at Mechanical Technology workshops in public schools. The study showed the nature and frequency of injuries in the Mechanical Technology workshops. The lack of safety due to unsafe conditions, incompetent teachers, inadequate training and supervision, as well as fear of working with machinery have a detrimental effect on educational practices, safety obligations, and quality of education. Teachers adapted to a certain extent by establishing their own policies or measures, but this is not sufficient and cannot be enforced at schools – and compliance or not – largely takes place informally and in a voluntary manner. This results in learners receiving training in workshops being unnecessarily exposed to possible injuries. Workshop safety policies specifically intended for workshops will need urgent attention. These safety policies must be enforced through school policies, legislation, regulations, and subordinate legislation. Furthermore, this problem will have to receive attention in the initial training of teachers as well as those who are already practising.

Finally, the hope is expressed that the recommendations will be implemented in such a way that safety in workshops will improve and that the number of qualified teachers who teach Mechanical Technology and learners who take Mechanical Technology as a subject will increase so that the shortage of craftsmen and technically skilled employees in the labour market and in the manufacturing sector will be addressed.

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