Soshanguve Engineering School of Specialisation

National Association for School of Technology Conference 2025

Innovating Technical Education in a Changing World.

TLADI AMOS MASHIANE
PRINCIPAL

As a Principal in the 4IR dispensation, I stand to believe in creating a global competitive workforce with high quality engineering skills that are relevant and match technological advancement in the industry.

Our learners are given space, time, support and guidance to innovate and showcase their innovative talents and skills that resulted in solving current challenges in the automotive space.

Innovating Technical Education in a Changing World.

"In the face of rapid global change, our response must be bold, local, and future-driven. At Soshanguve Engineering School of Specialization, we don't just teach the future — we build it."

In a world defined by disruption, innovation, and constant transformation, technical education must become more than just knowledge transmission — it must be a force for empowerment, problem-solving, and progress. As a school of specialization, we have taken a stand: to equip our learners not only with skills but with the confidence, creativity, and courage to shape their own futures. Whether it's electric vehicle innovation, robotics, or green technologies — our classrooms are laboratories for tomorrow. We are not waiting for the future to arrive — we are actively engineering it, led by the hands, minds, and dreams of our youth.

Reimagining Learning. Powering Innovation.

At Soshanguve Engineering School of Specialization, we believe that real transformation starts where education meets innovation. Our learners are not just taught — they build, design, and create. They are at the forefront of youth-led innovation, driving solutions like electric vehicles that address both local needs and global challenges. Through projects like these, we address critical issues like transport inequality and climate change from within the classroom. But we know we can't do it alone. Our success lies in strong partnerships — with government, industry leaders, and our surrounding communities. Together, we are shaping an education model that is agile, inclusive, and relevant — one that doesn't just prepare learners for jobs, but prepares them to create them.

Our learners are not just learners — they are engineers, designers, and change makers preparing to lead South Africa into a new era.

Key Points to Consider

- Project based Learning
- Innovative
- Creative Thinking
- Problem Solving for real world Challenges

✅ Youth-led Innovation Driving Institutional Agility

•Empowering learners to **solve real-world problems** through innovation strengthens the adaptability of institutions.

•The project shows how public education institutions can be **incubators of future-ready solutions**.

✅ Bridging Historical Gaps in Transport Access

•The EV project offers a **sustainable alternative** to transport, especially in under-resourced communities.

•It directly addresses **historical imbalances in service access** by reimagining public service delivery through innovation.

✅ **Local Solutions to Global Challenges**

•Tackles **climate change and carbon emissions**—a global issue—through local ingenuity.

•Reflects institutional capacity to **adapt global sustainability goals** to the local South African context.

✅ **Agile Learning and Responsive Education Models**

•Demonstrates how agile, project-based learning enables schools to **respond quickly to future skills needs**.

•Encourages the integration of **STEM, green economy, and digital skills** in public education.

✅ **Partnerships and Multi-Stakeholder Collaboration**

•Highlights the role of collaboration between **government, schools, industry, and community** in driving service innovation.

•Such partnerships are critical in building **resilient and responsive public systems**.

✅ Catalyst for Equitable Economic Opportunities

•The EV innovation can inspire **entrepreneurship, job creation**, and localized manufacturing—especially in marginalized areas.

•Promotes **inclusive economic growth** led by historically disadvantaged youth.

✅ Scalable Innovation for Service Delivery

•The learner-developed EV is a **proof of concept** that can be scaled or replicated in other communities.

•Public institutions can learn to be **more experimental, iterative, and citizen-focused** in service delivery.

Key Learner Projects

SOLAR LOCOMOTIVE 2022-2023

Awards/ Exhibitions

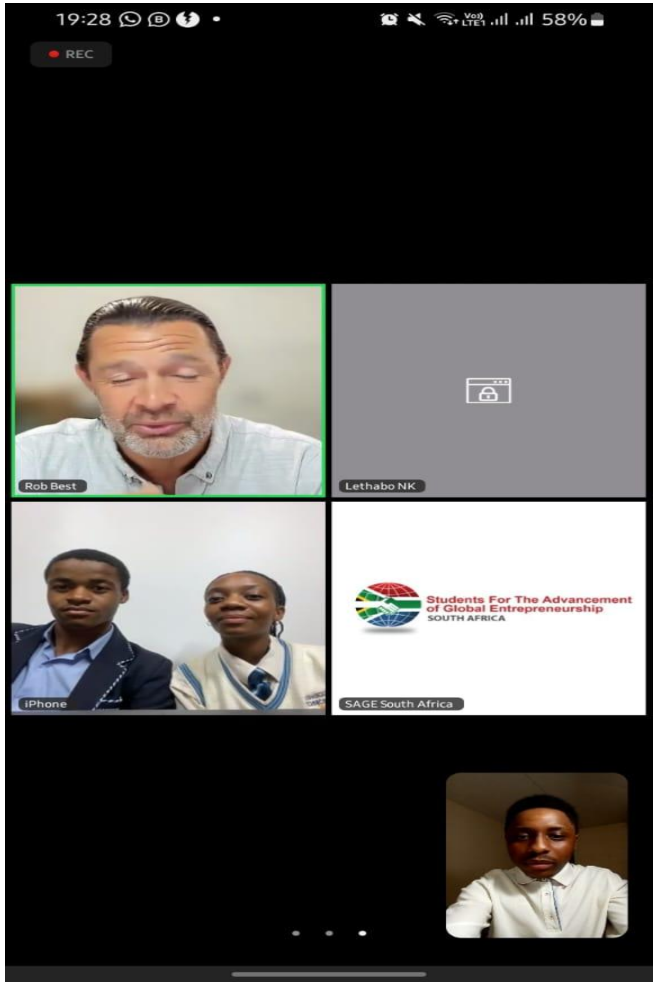
- World Clean Tech Award Winner
- SOS Festival Award Winner
- SASOL Carnival City Exhibition
- SASOL TechnoX Exhibition
- Sage National Award Winner

ELECTRIC CAR 2023-2024

Awards/ Exhibitions

- Batho Pele Public Service Award Winner
- SOS Festival Award Winner
- Business Gala Dinner Exhibition
- Silver Medal Best Innovation in service Delivery

Pictures and videos



2023 SAGE virtual World Cup – Virtual presentation and 2 UN awards won by the learners

MORE INFORMATION

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www.sosh-technical.co.za

Focus Automotive

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

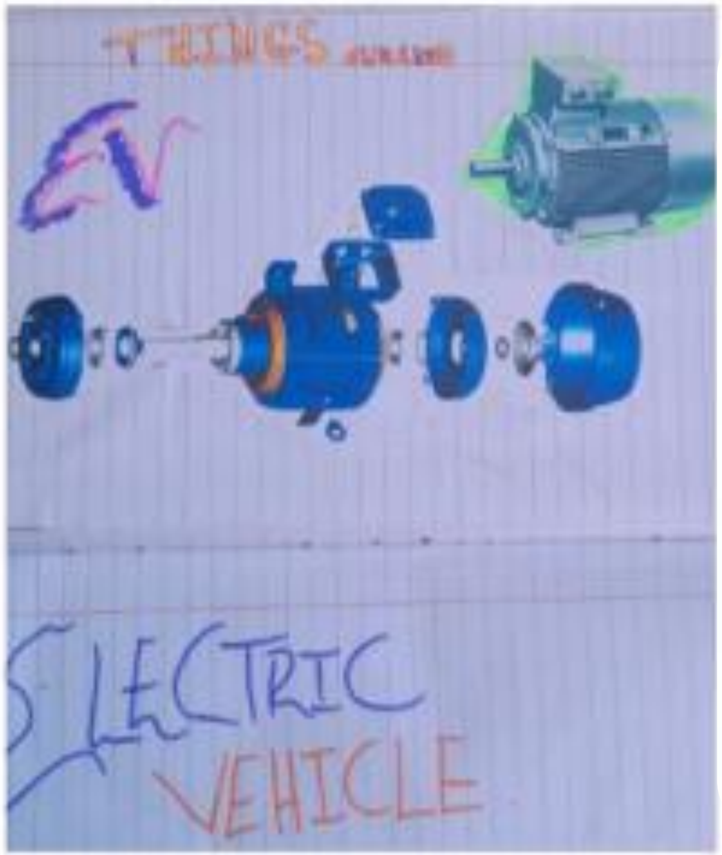
PICTURES

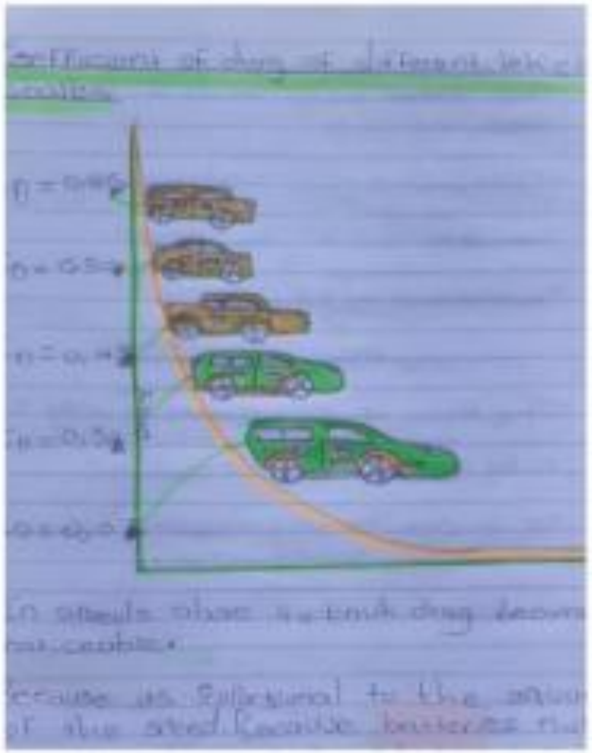

"Empowering Together The CleanTech Decade!"
CleanTech
work, says Mashiane

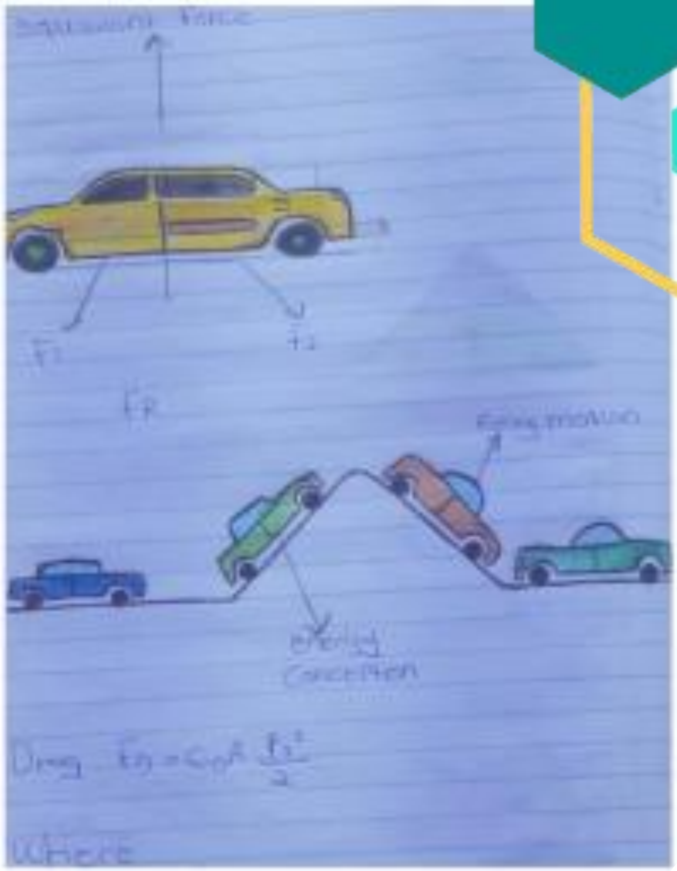
Project Timeframe

Activity	Duration (work days)	Start Date	Est Finish Date
Idea Conceptualization	**2 Weeks**	**09/05/2023**	**24/05/2023**
Literature Review	**3 Months**	**05/06/2023**	**07/08/2023**
List of Materials	**5 Days**	**09/08/2023**	**16/08/2023**
Design	**5 Weeks**	**17/08/2023**	**06/09/2023**
Building Chassis & Suspension	**3 Weeks**	**11/09/2023**	**29/09/2023**
Body Work	**4 Weeks**	**04/10/2023**	**31/10/2023**
Painting – Primer, Base & Clearcoat	**3 Weeks**	**06/11/2023**	**24/11/2023**
Electrical and Electronics	**3 week**	**08/01/2024**	**26/01/2024**
Battery Pack	**2 Weeks**	**29/01/2024**	**08/02/2024**
Drive train	**3 Weeks**	**12/02/2024**	**28/02/2024**
Upholstery & Trim	**2 Weeks**	**04/ 03/2024**	**15/03/204**
Finish the Prototype			**28/03/2024**

Literature Review - Journal







Learners are required to keep a journal to record useful ideas to be applied in a project

Project Team

Project Learners together with mentor

Project Learners together with mentor

Background Reading

The project commence with literature review to understand relevant concepts prior to design process.


THUMA MINA

Original Body Work

Body Work

The team is mixing painting materials in correct proportions and quantities to ensure seamless application. The outcomes is pleasing

Electric Hup & Motor Controllers

Prototype - Chassis

Learners are fabrication Chassis and assemble suspension system

Install Motors & Moto Controllers

The team install hub motors together with motor controllers.

Prototype Suspension


Soshanguve Engineering School
of Specialisation
ELECTRIC VEHICLE PROJECT


2118

THANK YOU

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Enquiries: Mr. Mashiane T.A (Principal)

Literature Review – Sources (Articles)

ELECTRIC VEHICLE TECHNOLOGY EXPLAINED

SECOND EDITION

James Larminie
Oxford Brookes University, UK

John Lowry
Consultant Engineer, Swindon, UK

Electric vehicles: a review of their components and technologies

Ahmed Abd El Baset Abd El Halim[1], Ehab Hassan Eid Bayoumi[1], Walid El-Khattam[2], Amr Mohamed Ibrahim[2]
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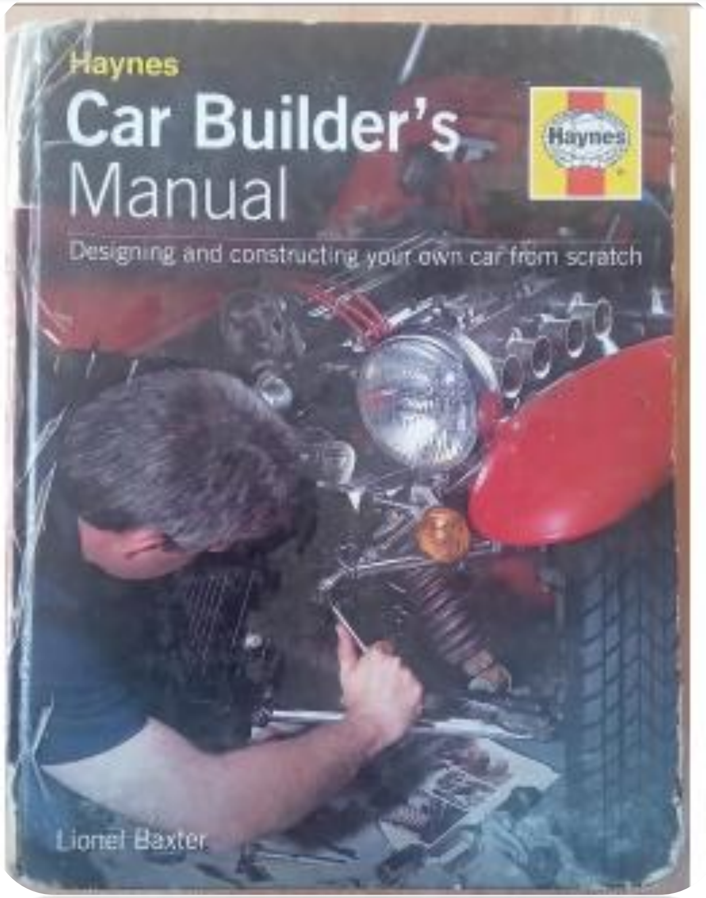
Electric vehicles
Energy sources
Equalizer

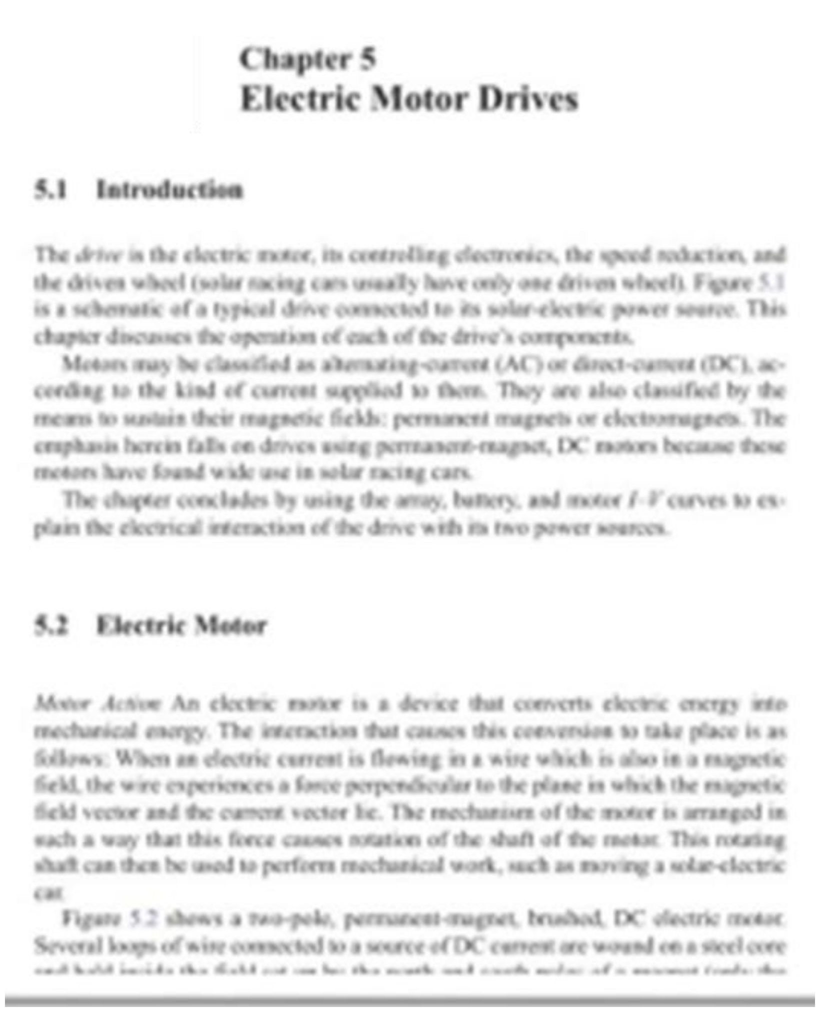
ABSTRACT

The number of electrical vehicles (EVs) on the road has increased in recent years, including battery-electric vehicles (BEV), hybrid-electric vehicles (HEV), plug-in hybrid-electric vehicles (PHEVs), and fuel-cell electric vehicles (FCEV). This mode of transportation is expected to eventually replace internal combustion engine (ICE) vehicles, based on current trends. Each key EV component integrates several technologies that are either currently in use or have the potential to become prominent in the future. Environmental, power systems, and other industries may be adversely affected by electric vehicles (EVs). With sufficient EV penetration, the current power system could be subjected to severe instabilities; nevertheless, with proper management and coordination, EVs can significantly contribute to the success of the smart grid concept. Moreover, EVs have the potential to significantly cut transportation-related emissions of greenhouse gases. However, there are still considerable barriers that EVs must overcome before they can completely replace ICEs. The purpose of this study is to review all the relevant information available on EV architectures, battery energy sources, charging processes, and control approaches. Its goal is to provide a comprehensive overview of current EV technology.

Learners use article abstracts to determine relevance of content

Literature Review – Sources (Articles)





Chapter 5
Electric Motor Drives

5.1 Introduction

The *drive* is the electric motor, its controlling electronics, the speed reduction, and the driven wheel (solar racing cars usually have only one driven wheel). Figure 5.1 is a schematic of a typical drive connected to its solar-electric power source. This chapter discusses the operation of each of the drive's components.

Motors may be classified as alternating-current (AC) or direct-current (DC), according to the kind of current supplied to them. They are also classified by the means to sustain their magnetic fields: permanent magnets or electromagnets. The emphasis herein falls on drives using permanent-magnet, DC motors because these motors have found wide use in solar racing cars.

The chapter concludes by using the array, battery, and motor *I-V* curves to explain the electrical interaction of the drive with its two power sources.

5.2 Electric Motor

Motor Action An electric motor is a device that converts electric energy into mechanical energy. The interaction that causes this conversion to take place is as follows: When an electric current is flowing in a wire which is also in a magnetic field, the wire experiences a force perpendicular to the plane in which the magnetic field vector and the current vector lie. The mechanism of the motor is arranged in such a way that this force causes rotation of the shaft of the motor. This rotating shaft can then be used to perform mechanical work, such as moving a solar-electric car.

Figure 5.2 shows a two-pole, permanent-magnet, brushed, DC electric motor. Several loops of wire connected to a source of DC current are wound on a steel core

Learners are encouraged to use as much sources as possible to grasp concepts

List of Materials & Components

After background reading, learners are able to size components and derive a list of materials needed

List of Materials (components specs omitted)

Battery Pack	*Quantity*	*Unit Price*	*Price*
Cooling fan	1	R299.00	R 299
Brushless Hub Motors	2	R 48 000	R 96 000
Motor Controllers	2	R 6 500	R 13 000
Dc to DC converter	1	R 255	R 255
High Voltage wiring	10 meters	R 80	R 800
Suspension parts		R 15 000	R15 000
Wheel sets	Set	R 9000	R 9000
Steering System	1	R 5 000	R 5000
Upholstery & Seats		R 7 000	R 7000
Electronic Braking System	1	R 250	R 250
Contactors	1	R 1 500	R 1 500
Fuse	3	R 305	R 915
Circuit Breaker	1	R 375	R 375
Throttle	1	R 1 400	R 1 400
Tachometer	1		
Square Tubes – 6m	3	R379	R 1 137
Paints, Clear coat, primers, Thinners & other painting materials, etc.			R 7 500
Total		**R 95 343**	**R 159 431**

Prototype - Design

After background reading, learners are ready to commence with design process using EGD skills

Excursion

Learners on an excursion to learn principles of aerodynamics and other critical forces applied on a vehicle using air tunnel simulator

Prototype - Design

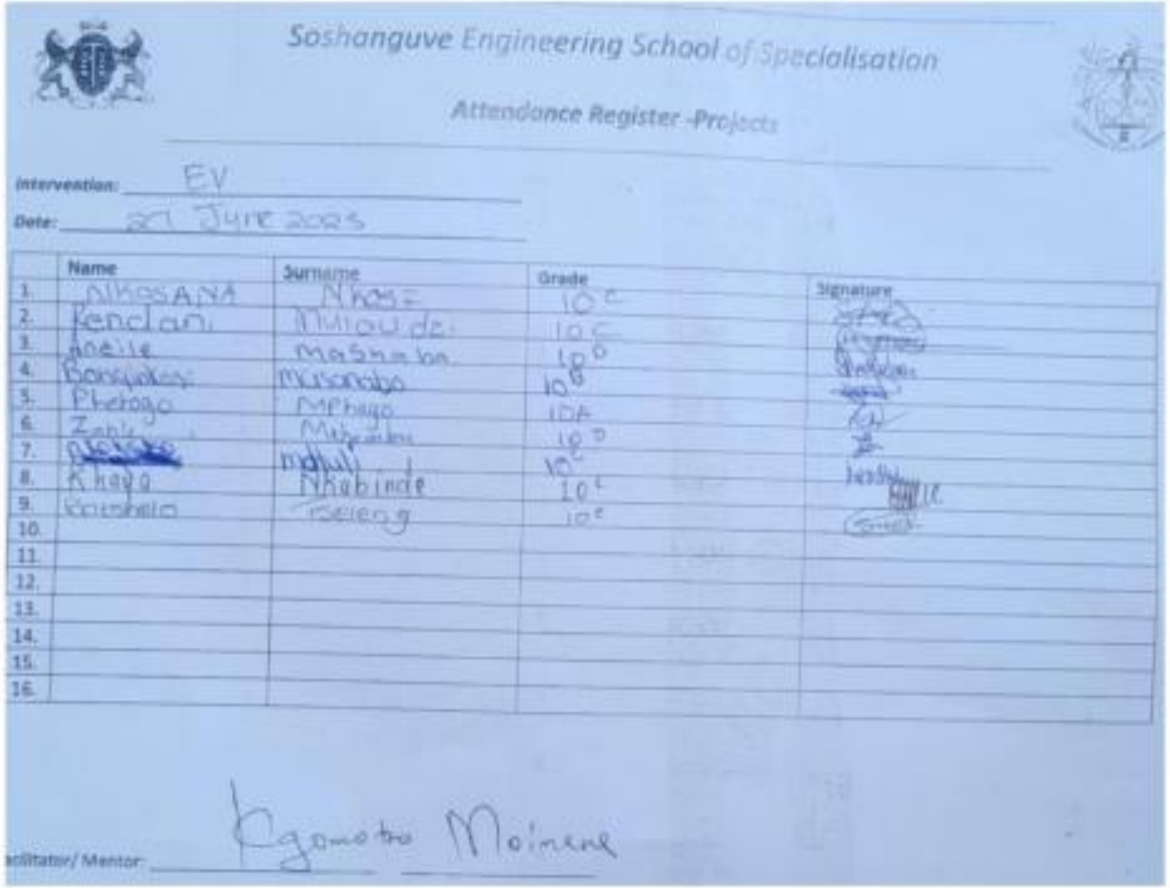
After background reading, learners are ready to commence with design process using EGD skills




Final Project of EV




Attendance Registers



Soshanguve Engineering School of Specialisation

Attendance Register -Projects

Intervention: EV

Date: 27 June 2023

	Name	Surname	Grade	Signature
1.	NKOSANA	Nkosi	10C	[illegible]
2.	Rendani	Mulaudzi	10C	[illegible]
3.	Anele	Mashaba	10D	[illegible]
4.	Bonginkosi	Masondo	10B	[illegible]
5.	Phetogo	Mphaga	10A	[illegible]
6.	Zinhle	Mahlangu	10D	[illegible]
7.	[illegible]	Mdluli	10C	[illegible]
8.	Khaya	Nkabinde	10[illegible]	[illegible]
9.	Katlehelo	Tseleng	10[illegible]	[illegible]
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11.				
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14.				
15.				
16.				

Facilitator/ Mentor: Kgomotso Moinene

Soshanguve Engineering School of Specialisation

Attendance Register -Projects

Intervention: EV Project

Date: 6 June 2023

	Name	Surname	Grade	Signature
1.	Rendani	Mulaudzi	10C	[illegible]
2.	Anele	Mashaba	10D	[illegible]
3.	Kakiho	Mkhize	10C	[illegible]
4.	NKOSANA	Nkosi	10C	[illegible]
5.	Zinhle	Mahlangu	10D	[illegible]
6.	Khaya	Nkabinde	10C	[illegible]
7.	Phetogo	Mphaga	9A	[illegible]
8.	Bonginkosi	Masondo	10B	
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Facilitator/ Mentor: Kgomotso Moinene

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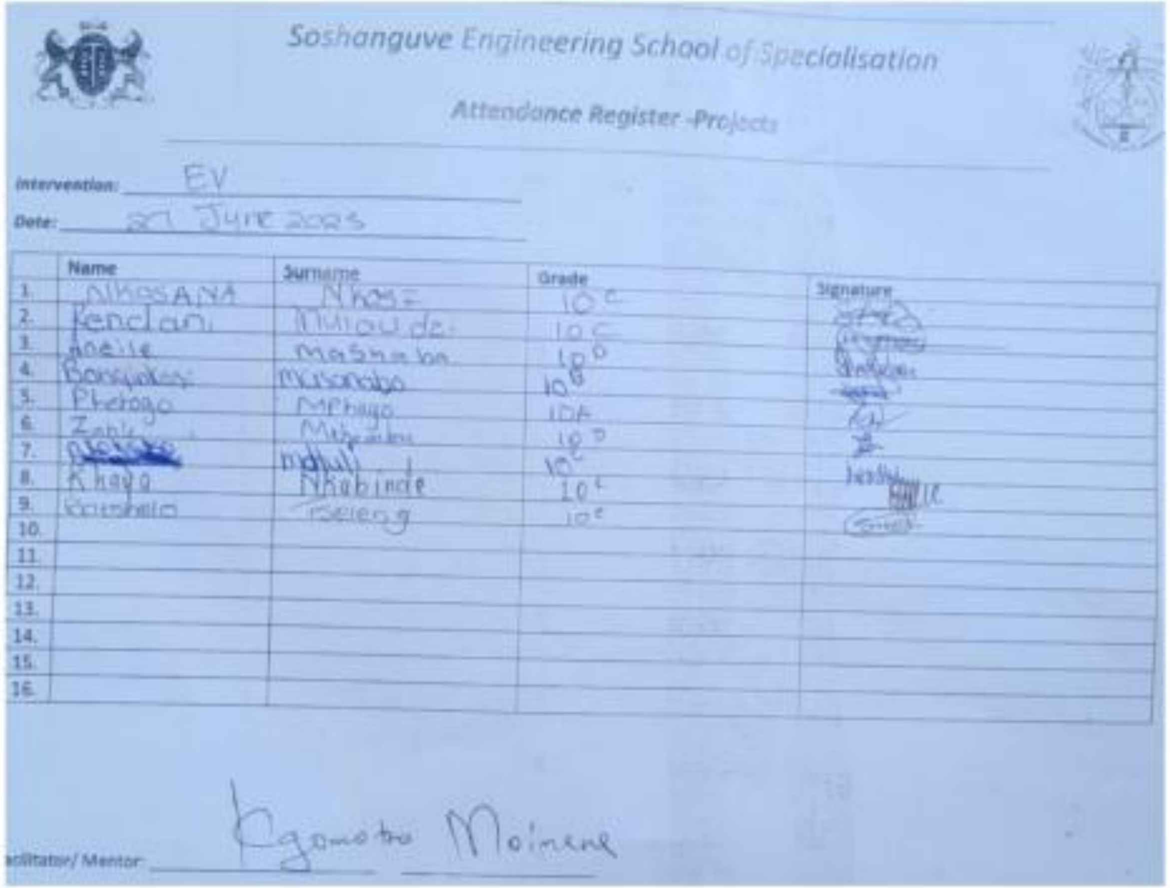

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8.	Khaya	Nkabinde	10C	
9.	[illegible]	Tseleng	10C	
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Facilitator/ Mentor: Kgomotso Moirene

Soshanguve Engineering School of Specialisation

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Date: 6 June 2023

	Name	Surname	Grade	Signature
1.	Rendani	Mulaudzi	10C	
2.	Anele	Mashaba	10D	
3.	[illegible]	[illegible]	10C	
4.	NKOSANA	Nkosi	10C	
5.	Zinhle	[illegible]	10D	
6.	Khaya	Nkabinde	10C	
7.	Phetogo	Mphaga	9A	
8.	Bonginkosi	Masondo	10B	
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Facilitator/ Mentor: Kgomotso Moirene

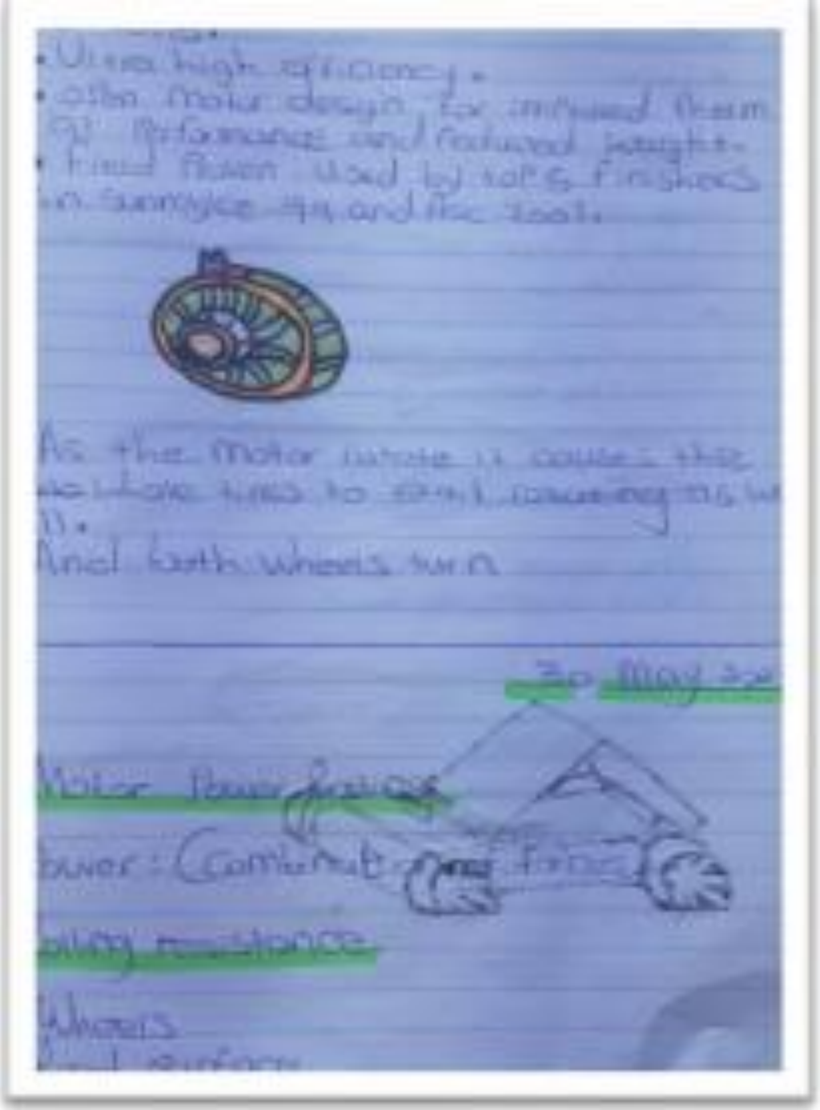
Consent Form

Parents of learners participating in projects are required to sign consent forms since learners often attend during extended hours


SOSHANGUVE TECHNICAL
ENGINEERING SCHOOL OF SPECIALISATION WITH AUTOMOTIVE FOCUS

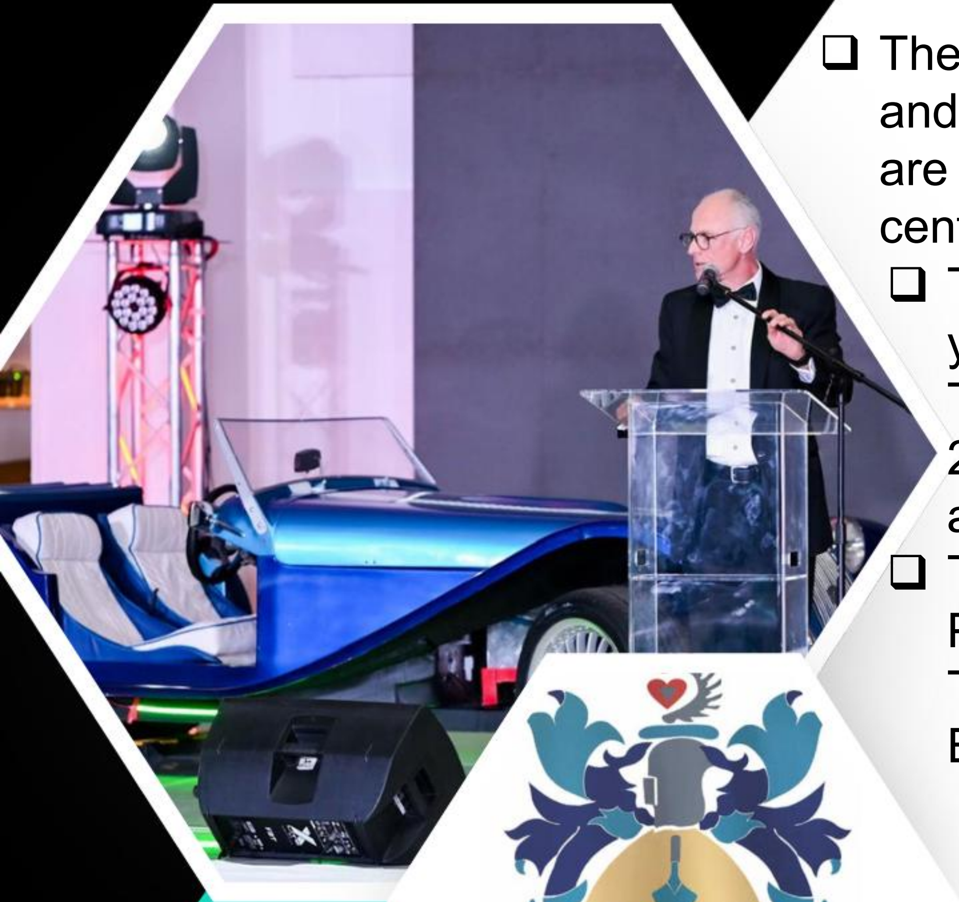
Parental Consent Form

Literature Review - Journal



Journal is also used to proof authenticity of the project

- The Soshanguve Technical High School was officially opened as the Technical Centre in the year 1985 catering only for the boys from the local schools. The girls were included at the later stage in 1996 to be educated in the Technical field.
- The school was then opened as a full Technical with the Technical Specializations combined with Pure Mathematics and Physical Sciences to cater for the Grade 8 – 12 learners.
- All the learners are doing Mathematics and Physical Science to qualify for the Engineering fields and Artisanship or Technicians.
- The practical Technical Skills were also introduced for the entire youth and adults of Soshanguve Community and the Surroundings to be trained on the Technical skills in
- Motor Mechanics (Petrol and Diesel Engines), Boiler Making, Arc and Gas Welding, Electrical Heavy and Light Current, Woodworking; Bricklaying and Plastering; Computer
- Aided Drawing; Computer Literacy; Office Administration; Fashion Design; Auto Electrical and Plumbing.



- The school is still continuing in the training of the unemployed youth and adults in the Technical skills program during the weekends. There are some trainees that manage to qualify at the NDLELA trade test center.
  - The total number of 535 trainees were trained in the year 2016.This year in 2018 only a total of 365 trainees completed their skills program. There is also a National Merseta Artisan program where the 21 young 2015 matriculates are presently training in the school on the automotive artisanship.
  - They are representing the Gauteng Province among the other nine Provinces. There is a total of 210 trainee Artisans from the ten Technical High Schools chosen by the National Department of Education to be part of Merseta in all the Provinces.
    - At the moment this learners are at the final stage to complete the program being ahead of other Provinces.
    - Soshanguve Technical is doing the program to also add to the artisans for the National Development Plan (NDP).
    - The school achieved 92.3% Matric pass rate in 2018 which was the best improvement in the field of specializations and awarded a certificate of being the best Technical school in the District.