


An Artist within, brings out the Drawing in Class: A Creative Approach to Teaching and Learning Engineering Graphics and Design



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ABSTRACT

Allowing Engineering Graphics and Designs (EGD) learners to express themselves with music in the EGD class is part of what makes the lesson worth having. Validating learners to sing their hearts out during the lesson allows them to be willing to work on and complete their assigned EGD activities, love the subject, and long for the next lesson. This study therefore aimed to explore how an infusion of music in EGD lessons would impact teaching and learning of EGD. Some scholarly findings show that music can deeply provoke emotions, influence mood and affect cognitive performance. A qualitative approach was adopted and a purposive sampling technique where 13 grade 11 and 12 technical students doing EGD were sampled and music was infused during their EGD period. Data generated was collected using structured interviews and classroom observations. Thematically, data was analysed and responses were themed, compared, and contrasted to shed light on a creative approach to EGD and how it can enhance the teaching and learning of EGD. This study found that allowing learners to sing does give them a sense of ease and they become comfortable around the teacher. It relaxes their minds and enhances their performance. The study recommends that although the results have been positive, it also depends on the style of teaching that one uses and is comfortable to use. This study contributes towards creating enabling learning environment for EGD learners.

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INTRODUCTION

The Engineering Graphics and Designs (EGD) CAPS document asserts that EGD is a subject that imparts globally recognized ideas with practical and theoretical applications. EGD places a strong emphasis on imparting specific foundational knowledge as well as a variety of drawing methods and abilities so that learners can create and understand drawings in the contexts of mechanical, civil, and electrical technology. The role of EGD in engineering is to equip learners with basic engineering graphic communication skills to cater for careers in engineering. Careers such as draughtsmen, architects, civil engineers and mechanical engineers. EGD introduces learners to the basic drawing principles and skills to read and interpret drawings and transform those drawings into manufacturable products for the purpose of solving problems. A learner's skills development cannot be compromised in any way but can be nurtured in different ways. A happy child is able to work well. In most cases what makes learners happy is to be able to freely express themselves. Sometimes how they express themselves may cause chaos. No

teacher wants a chaotic class, however, that chaos may be changed into tolerable chaos. Learners like to sing a lot. Instead of rebuking such singing, there is a need to use it to the advantage of both learners and teachers, by turning it into a classroom management tool.

The purpose of this action research is to explore a creative way to enhance the teaching and learning of EGD by validating learners to do what they like in a controlled manner. It also seeks to develop strategies to create a flexible learning environment and manage the class without having to discipline the learners from time to time. To achieve this aim, the research seeks answers to the following questions:

- What effect does allowing learners to sing in an EGD class have on their behavior and attitude?
- To what extent does allowing learners to sing contribute to getting the work done in an EGD classroom?

The findings are presented in this paper.

LITERATURE REVIEW

Nature of EGD as a subject

EGD is an abstract subject.¹ To teach the subject, an EGD teacher needs intensive training and strategies to teach it hence Singh-Pillay, et.al., have raised concerns that many practicing teachers of EDG lack the pedagogical content knowledge needed, which then draws back to their experience.² One of the major skills a teacher should have in order to effectively teach EGD is spatial visualisation skill. The issue of gender always comes into play, where in most studies male pre-service teachers displayed higher scores in spatial visualisation tests but Singh-Pillay, et.al, in their study beg to differ as they discovered that females scored higher than males.³ They further illustrate that the shift is due to the background that females have in playing with Lego blocks and patterns. In countries outside of South Africa, EGD is known as Technical Drawing (TD). Its definition is similar to the definition of EGD in South Africa (SA). In the United States of America (USA) TD is termed a time-honoured art form that is used in all disciplines of Engineering such as Aerospace, Architectural, Civil, Electrical, Mechanical, etc. It is further articulated that one should carefully plan their drawing and how they will utilize the drawing space they have. In all instances, for one to have a properly planned drawing, one needs to have a relaxed mind.

Effect of Recess on Learner Behaviour

Alliance, et.al., define the term recess as a comprehensive word for purposeful, independent, unstructured play for all learners in school from infancy to puberty, preferably outside.⁴ Learners behave in a certain way due to certain reasons. Recess is one of the contributing factors to learner behaviour. Findley revealed that after a recess, some teachers find it challenging to bring their learners back on task. Furthermore, Findley discovered that compared to boys, girls played more socially sedentary games.⁵ The researchers noted that children who engaged in physical play during recess returned to class less attentive. On the other hand, more attention was paid to individuals who played in a social but less active manner. They concluded that, whether or not there was a recess, boys tended to be more agitated in the classroom. In this research, the participants were boys. The class that was selected only had boys who were doing EGD. Their behaviour especially during instructional times before recess or after recess is restlessness. It is therefore for this reason that an alternative method had to be implemented to keep order during instructional time. The researcher felt the need to validate the learners in what they like to do the

¹ Department of Basic Education, *Curriculum and Assessment Policy Statement Grade 10 - 12 Engineering Graphics and Designs* (Pretoria.: Government Printing Works, 2011).

² Asheena Singh-Pillay, Douglas Sibusiso Sotsaka, and Jose P Abraham, "Interconnectedness Of Engineering Graphics And Design Teachers' Understanding Of And Teaching Of Assembly Drawing," *PONTE International Journal of Science and Research* 73, no. 6 (2017).

³ Asheena Singh-pillay and Douglas Sotsaka, "An Exploration of First Year Pre-Service Engineering Graphics and Design Teachers' Spatial Visualisation Ability at a University of Technology," *Journal for the Education of Gifted Young Scientists* 8, no. 2 (2020): 681–90.

⁴ Global Recess Alliance et al., "Recess in the 21st Century Post-COVID World," *The Journal of School Health* 92, no. 10 (2022): 941.

⁵ Jill Findley, "Effects of Recess on Student Engagement," 2017.

most and blend it with their learning. The learners like to sing a lot and that caused a lot of chaos, the researcher then opted to use that to their advantage.

Effect of Music on Learning

Victor asserts that music creates a comfortable environment and provides emotional support during stressful times.⁶ In addition, Habe, et.al., suggest that there are several influences that affect young people's wellbeing during late adolescence, a developmental age that is difficult to navigate between childhood and maturity.⁷ It is said that one of the best methods for promoting well-being is through the use of music. EGD being an abstract subject is stressful, especially when new concepts are being introduced. The diagnostic report brings to light that the low performance in many exam centres has made it clear that there are still numerous issues with teaching and learning.⁸ It would benefit the process of teaching and learning to have a measure in place to lessen the emotional burden that learners carry. Hence music can create a conducive environment for relaxation. Due to the fact that emotions improve memory and that music arouses powerful emotions, Jäncke posits that music may have a role in the creation of memories, whether they are related to specific musical compositions or events and details.⁹ This in turn will play a crucial role in a learner's memory about a specific drawing. Hu et.al., concur with Janke when they assert that people's emotions and behaviors have been shown to be influenced by music.¹⁰ Furthermore, Aguirre, et.al., highlight that learners are inspired to take part in and become more involved in class activities.¹¹

THEORETICAL FRAMEWORK

This research is framed by Bowlby's attachment theory. Cherry, argues that the main idea of attachment theory is that infants can gain a sense of security when their primary caregivers are present and attentive to their needs.¹² When a baby sees that its caretaker can be relied upon, it establishes a safe foundation from which to explore the outside world. She further highlights that the history behind Bowlby's theory of attachment was when Bowlby defined attachment as the "lasting psychological connectedness between human beings."¹³ This attachment begins at birth. Mary Ainsworth further contributed to the theory when she looked at how mothers fed their infants and examined the bond that is formed between them. The theory has four stages of attachment as follows:

- Pre-attachment – This is an infant stage between birth and sixth week where the baby shows no attachment to any particular caregiver.
- Indiscriminate – This is between six weeks to seven months when the baby starts having preferences for primary and secondary caregivers (perceived behaviour of the baby in different people)
- Discriminate – This is a stage at seven months and above where the baby shows attachment to one caregiver (cases where the child is only happy at mom's hands and cries when others take it)
- Multiple attachment – This is a stage from 10 months when the baby displays attachment to different caregivers

The last stage of attachment is where the teacher comes in as a secondary caregiver. In the context of this research; it is important to create a bond with learners so that they feel safe enough to talk to a teacher about their challenges. It makes the teachers less frightful for shy learners.

⁶ D. Victor, "How Music Helps People Heal: The Therapeutic Power of Music," 2023, <https://www.harmonyandhealing.org/how-music-helps-people-heal/>.

⁷ Katarina Habe, Snježana Dobrota, and Ina Reić Ercegovic, "Functions of Music, Focused on the Context of Music Listening, and Psychological Well-Being in Late Adolescence Regarding Gender Differences," *Frontiers in Psychology* 14 (December 21, 2023), <https://doi.org/10.3389/fpsyg.2023.1275818>.

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⁹ Lutz Jäncke, "Music, Memory and Emotion," *Journal of Biology* 7 (2008): 1–5.

¹⁰ Department of Basic Education, *National Senior Certificate Diagnostic Report* (Pretoria: Government Publishers, 2020).

¹¹ Diego Aguirre, Daisy Bustinza, and Mijail Garvich, "Influence of Songs in Primary School Students' Motivation for Learning English in Lima, Peru," *English Language Teaching* 9, no. 2 (January 18, 2016): 178, <https://doi.org/10.5539/elt.v9n2p178>.

¹² Kendra Cherry, "What Is Attachment Theory: The Importance of Early Emotional Bonds," *Psychology Today*, 2019.

¹³ John Bowlby, *Attachment and Loss: Vol. 1.* (New York: Basic Books, 1969).

METHODOLOGY

Research Design

This research adopted a descriptive research design. Data was collected through structured interviews and observations of learner behaviour in class during the lesson while singing. This research advocates for allowing learners to sing during EGD, however, also proposes how to allow the singing in class in a manner that will not disrupt teaching and learning as well as disrupting other classes.

Research Paradigm

This research adopted an interpretivist paradigm. The researcher interprets learner behaviors as well as their responses to questions to actually find coherence in what learners say and what they do. It is through such interpretations that a researcher arrives at conclusions about what he has seen and experienced during the exercise of the study.

Research Approach

This research employed a qualitative approach, which focuses on the insights and views of participants. The study adopted this research approach, to collect the views, behaviours and experiences of the participants.

Sampling

This research employed a purposive sampling technique, where 13 EGD learners were sampled.

Data Collection

This research used interviews as a data collection tool. Furthermore, learner behaviour was also observed when the teacher was present and when the teacher was not in class.

Results Analysis

This study gathered data using interviews and classroom observation, which led to the data giving themes to the research for thematic analysis.

Ethical Clearance

Permission to conduct this study was obtained from the KwaZulu Natal Department of Basic Education. Permission was further sought from the school principal. Consent letters were issued to the learners to seek permission from parents to be part of the study.

PRESENTATION OF FINDINGS AND DISCUSSION

Interviews

To seek answers to the research questions, interviews were conducted and classroom observations were made. Learner biographical information was presented during interviews to get their grade and how long have they sung. The data was collected in 2023 when grade 12 learners and a few grade 11 EGD learners took part in the study.

Table 1: Biographical Information

Learner	Grade	Gender	When did singing start?
A	12	Male	<i>In grade 10</i>
B	11	Male	<i>In 2021</i>
C	12	Male	<i>In grade 10</i>
D	11	Female	<i>In grade 10</i>
E	12	Male	<i>In 2022</i>
F	12	Male	<i>In grade 10</i>
G	12	Male	<i>In grade 10</i>
H	12	Male	<i>In grade 10</i>
I	12	Male	<i>In grade 10</i>
J	12	Male	<i>In grade 10</i>

K	12	Male	<i>In grade 10</i>
L	12	Male	<i>In grade 10</i>
M	11	Male	<i>In grade 10</i>
Source: Author's Development			

Technical Subjects at the school where data was collected are mostly popular with boys, hence there is only 1 female participant. In grade 12, there were only boys. The boys who were in grade 12 during data collection (2023) had started in 2021. Learner E joined the technical stream in grade 11. In a nutshell, those in grade 12 had been singing in class for 3 years and those in grade 11 had sung for 2 years (2022 – 2023).

Theme 1: EGD Learning Environment		
This theme looks at the general overview of the lesson from the learner's perspective.		
	Before	After
Learner	Response 1	Response 2
A	<i>"The lesson was just normal"</i>	<i>"It was good"</i>
B	<i>"It was good but not enough"</i>	<i>"It was good and I enjoyed"</i>
C	<i>"It was nice"</i>	<i>"It was good and you enjoy"</i>
D	<i>"It was good because I was concentrating"</i>	<i>"It is good but bad at the same time because I cannot concentrate"</i>
E	<i>"It was good"</i>	<i>"It was relaxed"</i>
F	<i>"It was perfect"</i>	<i>"It was good"</i>
G	<i>"The lesson was not easy"</i>	<i>"It easy to do when we sing during EGD"</i>
H	<i>"the teacher was very serious"</i>	<i>"It is very nice, we feel free to ask"</i>
I	<i>"It was just a lesson"</i>	<i>"It was a good lesson, I enjoy the lesson when I sing"</i>
J	<i>"It was boring"</i>	<i>"It was amazing because we feel free and we understand everything"</i>
K	<i>"It was too tight and stressful"</i>	<i>"It is relaxed and fun"</i>
L	<i>"It was a very strict lesson, sometimes I would worry if I have to go to class"</i>	<i>"It is better now and I enjoy being in class"</i>
M	<i>"It was good"</i>	<i>"It was a good way to learn EGD"</i>
Table 2		
Source: Author's Development		

Table 2 represents data collected for theme 1. This data aimed at addressing the first research question earlier mentioned. This data concurs with that of Victor when he asserts that music creates an enabling environment and provides emotional support during stressful times. Learner K brings much evidence in agreement with Victor, as he mentions that before they started singing in class the lesson was stressful, but after they started singing, they felt more relaxed.¹⁴ Learner H also felt that the teacher was very serious but after they started singing, they felt free to even engage with the teacher and ask questions. However, some views differed as shown in the table, but most learners stated that the learning environment was tense for them and that after they were validated to express themselves in singing, they started to be at ease. Hence Learner I said, *"It was amazing because we feel free and we understand everything"*. This then implies that creating an enabling environment for learners can have a positive impact on teaching and learning, thus creating a fruitful bond between a teacher and learners, as explained by Bowlby's Theory of Attachment.

¹⁴ Victor, "How Music Helps People Heal: The Therapeutic Power of Music."

Theme 2: Work Rate		
This theme looks at how singing affects the learner's work rate.		
	Before	After
Learner	Response 1	Response 2
A	"It was very good"	"Singing does not affect my task"
B	"It was good but not perfect"	"It improved my work rate"
C	"It was good"	"Singing makes me work faster because I enjoy"
D	"It was good"	"There is too much noise"
E	"It was tense"	"It was more relaxed"
F	"It was great"	"It was not affecting my work"
G	"I was failing"	" I passed EGD because we were singing when we were drawing"
H	"It was not good"	"My work was improved"
I	"It was lower because it was hard"	"When I start singing, I feel the drawing so my marks increase"
J	"It was small, I did not like it"	"It did not affect me"
K	"It was not as bad but it was kind of challenging"	"Singing brought a lot of focus and release, it also helped with progress and speed"
L	"I got about 60%"	"It improved because I enjoyed singing"
M	"It was very bad"	"It did not affect me anywhere"
Table 3		
Source: Author's Development		

While one may see singing in an EGD class as chaos, the researcher felt it was important to also look at how the singing will affect the learners' work rate if singing was to be used as a strategy. EGD being an abstract subject, learners attested to Maeko and Khoza's statement hence Learner G stated that he was failing and Learner M said his work rate was very bad. While for some it was not much of a problem, for some learners it was challenging because EGD is an abstract subject. Learner I also reveals that his work rate was lower because EGD was hard. Allowing them to do what they liked changed the narrative. As asserted by Aguirre, et.al., learners are inspired to take part in and become more involved in class activities, and the results prove this statement.¹⁵ After they were allowed to sing, for some learners it made a huge difference. Learner I said, "When I start singing, I feel the drawing so my marks increase". This is evident in learner participation in class activities. Class activities develop the learner's knowledge and understanding. Learner G also said that he passed EGD because they sang when they were drawing. His involvement in the activities grew hence the positive development in his EGD work.

Theme 3: Learner Attitude		
This theme looks at learner attitudes towards the teacher and the EGD lesson.		
	Before	After
Learner	Response 1	Response 2
A	"It was normal"	"It changed for the better"
B	"It was good"	"It has been really good and improved"
C	"Good"	"It did not change"
D	"My attitude towards my teacher is always the same, I respect my teacher"	"My attitude did not change"
E	"It was tense"	"It was nice, I was relaxed"
F	"It was good"	"It has not changed"
G	"My attitude is always to be a learner and respect the teacher"	"When I am not ok, after we sing my mood changes to be happy"

¹⁵ Aguirre, Bustinza, and Garvich, "Influence of Songs in Primary School Students' Motivation for Learning English in Lima, Peru."

H	"He was always serious and it was hard to communicate with him"	"He has become friendly with us and we easily communicate"
I	"My attitude was lower like my performance"	"The day I started singing, things changed because when I sing I feel the drawing and everything become possible"
J	"It was good during EGD work"	"It was good and it made me free to ask questions during EGD"
K	"Well he always appeared to be too strict and I feared him"	"Yes, a lot. I was more relaxed and comfortable around him"
L	"I was afraid of him. I thought he was very strict"	"I understood the lesson better"
M	"Not good"	"we started to do what he needed us to do"
Table 4		
Source: Author's Development		

The learning environment plays a crucial role in the attitudes of the learners to the teacher and the lesson. The relationship and bond between the teacher and learners also have an impact on their attitude towards the teacher and the lesson in general. Hu, et.al., have stated that people's emotions and behaviors have been shown to be influenced by music and this table is evidence of that. Looking at the learner attitudes it shows how they have been before the singing started and how has that changed.¹⁶ Some learners feared the teacher and felt that the lesson was rather a strict one. This then affected how they participated in the class activities and their attitudes towards the teacher as well. For some of them not being able to be comfortable enough to ask the teacher if they had questions, had an impact on their attitude towards the lesson. Learner M mentioned that their attitude was not good before they started singing; this speaks to how the learners would not participate in class activities. Learner I said, "My attitude was lower than my performance". The learner clearly shows how his attitude was and how it affected his marks. How it affects his marks speaks to his attitude towards the EGD lesson in general. However, after singing was allowed in class, he said "The day I started singing, things changed because when I sing I feel the drawing and everything becomes possible". This shows a step in the right direction caused by the singing in class.

Classroom Observation

The researcher made some observations on the field. A teacher narrated that, before students were allowed to use singing as a learning tool, they would come late to class after recess. As stated by Findley, after a recess, some teachers find it challenging to bring their learners back on task, It would take time to get the learners to pay attention to the business of the day.¹⁷ It was observed that the first 25 to 20 minutes of an hour of lesson would be lost in the chaos of late coming and noise, some sharpening their pencils, some making excuses about work not done at home, etc. The teacher stated that, at times a 45-minute drawing lesson would take them a week to finish. This had a negative impact on curriculum coverage and time given to cover EGD topics. There were also formal assessments that needed to be done within a certain period of time. However, after the teacher allowed them to sing, which is what they did the most, things started changing. Learners ceased to come late to class. They went as far as spending the last 30 minutes of their break time in the EGD class singing and doing EGD activities. They started enjoying coming to the EGD class and their performance improved.

¹⁶ Xiao Hu, Jing Chen, and Yuhao Wang, "University Students' Use of Music for Learning and Well-Being: A Qualitative Study and Design Implications," *Information Processing & Management* 58, no. 1 (January 2021): 102409, <https://doi.org/10.1016/j.ipm.2020.102409>.

¹⁷ Findley, "Effects of Recess on Student Engagement."

The narration continued that, one day the principal of the school was doing monitoring after recess and when he approached the EGD class, he heard music and thought that the learners were making chaos. When he entered the class, he was surprised to see everybody seated in their place drawing. The class was clean and neat. All learners were inside the class and there was no up and down going on. Everyone was singing and doing their work. At that time the EGD teacher had gone out to make copies. The principal asked the teacher what was going on and the teacher explained that this was the way to make them do their work if he allowed them to do what they love. The level of discipline among EGD learners also increased. The learners were no longer found in any misconduct and they loved singing. Although it seemed weird to infuse art in a technology class, other teachers also found it amusing to see what they saw.

Unfortunately, the teacher (researcher) had to leave the school due to greener pastures, but he made sure to cover all the content that was due to be covered for trial exams. He learnt that a lead EGD teacher was allocated for the learners. The researcher made a follow-up on how the learners were doing because he had developed a deep bond with them, the lead teacher told him they doing ok and he cried that they love to sing and they sing a lot. However, in their singing, they made sure to produce the work. He stated that he only had a few sessions with them and left them. Upon the arrival of the National Senior Certificate results, it was noted that the learners did extremely well in EGD and they also told the teacher that their music kept them going and gave them hope after the teacher had left the school.

Discussion Summary

This study revealed that EGD is a male dominated subject. While male participants shared similar views on music, the females shared rather different sentiments. The boys, however, had different views before the music and after. They felt more at ease after the music was introduced and that assisted in their performance. A comfortable environment was created and they felt comfortable around the teacher to consult about EGD freely.

RECOMMENDATIONS

This study recommends that when allowing learners to sing during an EGD lesson, the following must be put into consideration:

Noise level: The noise should be kept at a bare minimum volume during the activity. The aim is to create an eased atmosphere where learners are relaxed while working. Their music should not disrupt other classes.

Class activity: Singing should be allowed only during an individual drawing activity when learners are focused on completing a drawing. This is during the time the teacher walks around to check how learners are doing and can be stopped at any point in time for a teacher to address certain errors identified during observation of learners' work.

School Policies: The teacher needs to adhere to the school policies in terms of classroom management and making sure that the music is not disruptive to other classes. Also, music does not replace teaching and learning, but a way to aesthetically improve the mood to allow a more relaxed environment.

Song choices: Let the learners choose which songs to sing and allow them to lead for their own enjoyment while working. This exercise is more about them. For classes that take place after recess, music can be used to grab the learners' attention to dissolve the recess fever and get learners to focus on the teacher. This will in turn make the learners minimize late coming. The teacher is in control, every time. It is the teacher who decides when the learners start and stop singing.

CONCLUSION

This study sought to explore how an infusion of music in EGD lessons would impact the teaching and learning of EGD. On a good note introducing singing into an EGD class can have positive effects, it's essential to carefully consider the context, preferences of the participants, and the overall learning goals

of the class. Balancing creativity and professionalism is key to ensuring a positive and effective learning experience. It is also very important to consider classroom dynamics such as preparation for the change and how to manage the change. Furthermore, it should be noted that allowing learners to sing goes with the comfort of the teacher. What works for a certain teacher may not work for another teacher. However, it won't hurt to try music in class. While allowing learners to sing may be good, it is important to manage the class such that other classes are not interrupted.

FUTURE STUDIES

While this research focused on music to enhance the teaching and learning of EGD, other methods of creating an enabling learning space may be explored for EGD. It is important to note that there are so many factors that contribute to a learner's development; perhaps future research may dig deep into EGD learning spaces and teacher-learner relationships.

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