EXPLORING THE INFLUENCE OF CAREER AWARENESS ON THE UPTAKE OF STEM SUBJECTS BY RURAL GIRL LEARNERS

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Abstract

Learners in South African secondary schools are expected to choose subjects of specialization which will guide them to choose their preferred careers when they exit grade 9 in the General Education band (GET-Grade 8 and 9) where they are taught a generic curriculum to grade 10 in the further education and raining band (FET- Grade 10-12). It is during this exit phase that career awareness assists them to choose subjects that guides their career choices. The low choice of science, technology, engineering, and mathematics (STEM) careers by female learners is a worldwide challenge especially for learners in rural communities, because of some cultural stereotypes and challenges that female learners face in such communities. This paper used a qualitative study to explore how career awareness might influence the choice of STEM careers and subject choice for grade 9 female learners in two rural schools in a South African province. The study revealed that after learners were exposed to the career awareness program, several learners changed their career choices resulting in an increase in the number of learners who wanted to pursue STEM related careers.

Keywords: *Career awareness, STEM subjects, STEM careers, female learners.*

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1. Introduction and background

The challenge of female learners accessing STEM careers has been common in many countries and persists all over the world because of the cultural biases, such as gender-specific norms and role expectations which influences the way they are taught and their choice of subjects at school (Amponsah & Mohammed, 2019). Gender-specific norms and role expectations has culminated in the underrepresentation of women in critical areas such as STEM majors, and subsequently in STEM occupations (Sainz, 2011). The low proportion of women in STEM subjects leads to the spread of a gender stereotypical image and affects young people's career choices, leading to a mutual reinforcement of gender stereotypes, and gender gaps in career related interests and choices (De las Cuevas, García-Arenas, & Rico, 2022). Initiatives to increase access to education for female learners are continuing throughout the world, especially in developing countries like South Africa. However, women continue to be underrepresented in tertiary studies and professional careers in these fields (Shepherd, 2017). Female learners in rural areas are still the most affected because of the stereotype that still exists in these communities that as females, they cannot or should not pursue STEM careers. Whereas Langdon, McKittrick, Khan and Doms (2011) argue that underrepresentation of women in STEM subjects is a result of gender and cultural bias, Else-Quest, Mineo, and Higgins (2013) argue that the shortage of females in STEM related fields is a result of women's frame of mind to STEM related fields rather than ability. For example, girls perceive working in STEM fields as being socially isolated and this limits them from pursuing STEM careers as they prefer being social and pleasant (Reinking & Martin, 2018)

Other factors that may affect STEM career choices in females is the inability to identify with women in these fields and lack of awareness. Archer, Moote, MacLeod, Francis and DeWitt, (2020) argue that female learners' lack of awareness and aspiration to science careers affect career choices in STEM fields. This can result in the fewer students accessing science careers, thereby creating a shortage of opportunities to explore science careers in authentic environments (Bennett, Lubben, & Hampden-Thompson, 2013). Learners' interests in science field do not necessarily translate into motivation and/or ability to pursue these subjects. Schools are institutions that should guide learners' subject and career choices. Kang et al. (2021) emphasise the importance of increasing science career awareness at the lower grades in secondary schools, which might assist in retaining them in the science

subjects' stream and influence their career development. In the South African schools, learners take Natural Science, Mathematics, and Technology as general subjects. When they progress from Grade 9 to Grade 10, they are required to choose subject of specialization that will lead them into their desired careers (DoBE, 2012). Shepherd (2017) argues that STEM subject choices at secondary schools have implications for female leaners as they can improve economic development and growth, as well as address social inequality that continue to play a role in the inability of women to have access to higher paying employment opportunities. Thus, in Grade 10 the learners' subject choice is the key predictor of their STEM career choices. Blotnicky et al., (2018) add that career awareness is a precursor of aspirations, as a result sufficient information on these careers may influence the uptake of STEM subjects in high schools. However, in rural areas, few learners have personal knowledge of professionals actively working in STEM fields and they frequently lack understanding about science careers (Archer et al., 2013). The lack of knowledge and resulting in lack of interest in STEM related subjects and careers, was a motivation for this study. We sought to establish how STEM career awareness for grade 9 female learners in two rural schools in a South African province influenced their choices in choosing STEM careers. The study seeks to answer the following research question: *How did the awareness to STEM careers influence the uptake of STEM subjects by rural female learners in grade 10?*

2. Theoretical framework

The social cognitive career theory (SCCT) by Lent and his colleagues (1994) is used as a lens for this paper. The social cognitive career theory (SCCT) is aimed at explaining three interrelated aspects of career development: (a) how basic academic and career interests develop, (b) how educational and career choices are made, and (c) how academic and career success is obtained. This theory explains how interest is related to a career goal and action as they are exposed to conditions and requirements for pursuing STEM careers. The career awareness program in this study was aimed at exposing learners to STEM careers with the hope of improving the uptake and retention of rural female learners in the STEM subject stream. The career awareness session took place at a central school to both schools to enable them easy access to the venue. The career awareness program included real professionals in the STEM field sharing information on their daily work and the requirements for their jobs. This enabled learners to not only get information on STEM careers but to also interact with professionals in these fields. The professionals also shared benefits of STEM careers to arouse learners' interests in these careers more.

As the professionals shared information about their jobs, there was additional information provided in career awareness booklets which were given to learners. The booklets were provided as a reference resource for learners to explore and develop understanding about STEM careers, most of which were not presented at the career awareness program. The booklets provided to learners about STEM careers contained all information that enabled them to understand the subjects required for high school, entry requirements at tertiary institutions and career pathways. The information provided through the career awareness session exposed learners to important information on STEM careers which could assist them in future to choose careers that they want. The whole session complied with the SCCT theory in trying to develop learners STEM career interest, assist them in making informed decisions in choosing STEM careers and motivate them to choose STEM subject in the FET phase.

3. Research methodology

A qualitative research method was used to collect data from grade 9 female learners in two rural schools in a South African province. Qualitative research emphasises gathering of data on a naturally occurring phenomenon, mostly in the form of words rather than numbers (McMillan & Schumacher, 2010). The population of the study was two hundred and sixty-seven (267) female grade 9 learners (aged between 14-16 years) from two schools in a rural place, from which 40 (20 in each school) were identified by their teachers to participate in focus group interviews on their career choice to establish their STEM careers choices. The same learners participated in focus group interviews before and after the career awareness session, although all grade 9 female learners in both schools were invited to the career awareness session. The focus group interviews were semi-structured with pre-determined questions. The pre career focus group interviews took place two months before the career awareness session. The post focus group interviews took place a month after the career awareness session. Learners were encouraged to use a language of their preference to respond to questions because one of the researchers could speak a local language, so that they did not feel intimidated or shy to respond in English. Learners' responses were captured through an audio recorder then transcribed. Data collection comprised of the pre career awareness phase and the post career awareness phase with the career awareness session in between. Data was transcribed and thematic analysis was used to make sense of the developed data. The themes which emerged from data involving learners

'career choices before and after the career awareness session were, STEM careers, non-STEM careers, a combination of STEM careers, and a combination of non-STEM careers. Table 1 below summarises the results. Ethical considerations required for this study were all adhered to.

4. Results and analysis

The table below shows the career choices of the forty interviewed learners before and after the career awareness program.

Table 1. Career choices before and after the career awareness program.

	STEM careers	Non-STEM careers	Combination of STEM careers	Combination of Non-STEM careers
Pre career awareness interviews	9	4	1	4
Post career awareness interviews	15	1	9	5
Variance	+7	-3	+8	+1

Table 1 shows that out of the forty responses of learners who were sampled for the focus group interviews in both schools before the career awareness program, 10/40, learners STEM careers: six (6) learners indicated that they wanted to be medical doctors, mechanical engineers (3), and one (1) each indicated that they wanted to be a nurse, pediatrician, an optometrist, a dermatologist, science teacher, a psychologist and a mathematics teacher respectively. Eight out of forty, 8/40, learners choose the following non-STEM careers: an actor (3), a lawyer (3), a journalist, and a recreational therapist. There were learners who had more than one career choice, ranging from a combination of STEM and non-STEM careers. One learner had a choice between these two STEM careers: mechanical engineer or science teacher and four (4) learners chose the following combination of a STEM and non-STEM careers: a medical doctor or social worker, accountant or scientist, mechanical engineer or lawyer and a gynecologist or a lawyer. Only twenty-three (23) learners were clear about their career choices whilst seventeen (17) were not sure about their career choices. From the 23 who were clear about their career choices, at least 21/40 (52, 5%) was or included a STEM career, 8/40 (20%) had non-STEM career choices, and 17/40 (27, 5%) were not sure of their career choice and did not provide a career choice.

From a sample of 40 learners who participated in the interview prior to the career awareness program, only one learner could not attend the career awareness program. From the thirty-nine learners who were part of the pre career awareness interview and attended the career awareness program, there were learners who indicated interest in more than one career choice in the post career awareness interviews. Fifteen (15) learners chose STEM careers while nine (9) learners chose a combination of STEM careers. The following STEM careers were chosen by the learners: doctor, mechanical engineer, chemical engineering, pilot, surgeon, dentist, electrical engineering, forensic specialist, pharmacist, microbiologist, scientist, environmental specialist, nurse, psychologist, and aeronautic engineering. Six (6) learners chose the combination of non-STEM careers and only one learner chose a non-STEM career. The non-STEM careers chosen by the learners included the following: lawyer and social worker. Thus, 24/39 (61, 5%) learners choose at least one STEM career, and 6/39 (15.4%) learners had non-STEM career choices. The remaining number of learners remained unsure about their career choices.

Post career awareness program, Table 1 shows that the number of learners who chose careers that were STEM related increased after the career awareness program, whilst the number of learners who chose careers that were not STEM related decreased. An increase of one in the number of learners choosing a combination of non-STEM careers was observed, whilst a decrease of three for those that opted for non-STEM careers was observed. Table 1 shows an increase in the interest of learners in STEM career choices. For those that chose STEM careers, there was an increase of fifteen learners after the career awareness program, seven learners opting for one STEM career and eight opting for more than one STEM career. During the pre-career awareness interview, learners' career choices seemed to be based on careers that they were familiar with or those whom someone familiar to them was doing, whereas during the post career awareness interviews in addition to some of the careers that they were aware of, they chose careers that were either presented by STEM professionals or those that were in the booklets, with the exception of one learner.

5. Discussion

The increase in the number of learners who chose STEM careers from the pre career awareness to the post career awareness interviews indicate that the career awareness program was influential to their decisions on career choices. The exclusion of some non-STEM careers and addition of more STEM career choices seem to suggest that lack of exposure to STEM careers might affect learner career choices in those streams. This coincided with findings by Bennett et al. (2013); Archer et al. (2020), and Kang et al. (2021) that lack of awareness of authentic science related careers and aspiration can affect learners' interests and result in the fewer students accessing STEM careers, thereby creating a shortage of opportunities to explore science careers in authentic environments. After the career awareness program, learners' responses indicated some interests in these careers. Inviting STEM professionals to share information not only exposed learners to STEM careers, but also made learners to identify themselves as future STEM professionals, due to the social contacts with scientists (Archer et al., 2020). However, there were still some learners who remained undecided about their career choices even after the career awareness program. The study found that nine learners remained undecided about their career choices post career awareness program. This suggests that more career awareness programs and support is required to help these learners decide before they chose their subject choices in Grade 10. Such support may help learners choose the relevant subjects required by their choice of career.

6. Conclusion and recommendations

Subject choice affects career choices. The choice of specialization subjects in grade 10 allows for grade 9 teachers to provide information about these subject choices in grade 9 and provide guidance. This did not seem to have happen in the sampled schools, which could result in uninformed subject choices in grade 10. In addition to career awareness, female learners should be motivated to take up STEM subject choice if they have the potential to pursue STEM careers. This paper recommends that career awareness programs should be done throughout the year when learners get into grade 9, and they should include sufficient information about subject choices leading to the careers and, where possible, some professionals in other fields that learners can identify with.

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