

The Influence of Role Models on Career Path Selection in STEM

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Abstract: This study explored the impact of role models on students' career path selection at technical universities, using Gdańsk University of Technology (GUT) in Poland as an example. It examined how both role models and anti-role models shape students' career decisions during early career-path stages in secondary school and throughout their university education, as well as the reasoning behind students' career choices. To do so, the authors conducted a qualitative, exploratory study based on semi-structured interviews with 64 GUT students (four men and four women from each of the eight GUT faculties). The results showed that the impact of role models on young people's career path selection changes as the path progresses, from helping establish goals in the earlier stages to becoming a source of knowledge and skills during university studies. Furthermore, although others' suggestions were among the most cited reasons for choosing a study, students were reluctant to admit to others' influence. So, we observed a bias: students declared full self-independence in career path selection, stating that they were primarily motivated by intrinsic factors, especially their own interests, while at the same time reporting influencers who supported their choices. So, it means that students' need for independence is extreme, and it can be a source of bias. Furthermore, students who admitted being influenced by others were most likely to follow in the footsteps of family members, mostly fathers, either working in a similar field or having completed the same major. However, later during their studies at GUT, students became more influenced by their professors than by their family, shifting the focus from perceived closeness and relatability to their role models' teaching prowess. No significant gender differences were detected in the motivations behind the choice of study, with female and male respondents showing similar likelihood of being influenced by a role model. However, male respondents seemed more likely to be positively affected by interactions with role models, while female respondents were more likely to be negatively affected by anti-role models. Students have reported being impacted by a male 2.25 times more often than by a female. This suggests that, regarding the development of STEM careers, females need not be discouraged, while males need to be inspired. Educational institutions can use the findings of this research to enhance their academic offerings, improve the efficiency of teaching methods, maximize learning outcomes, and improve communication with students. However, further research is required to make findings universally applicable.

Keywords: Role models, Anti-role models, STEM (science, technology, engineering, mathematics), Gender studies

1. Introduction

The choice of career is among the most important that one has to make during their lifetime (Ahmed, Sharif, Ahmad, 2017). The formation of the career path begins long before actually starting a job, with a university major being a crucial choice (Germeijs and Verschueren, 2006). However, not much is known about the topic in the context of Technical Universities, which in Poland are considered an elite group, with some attracting six candidates per place (GUS, 2024). Thus, the attitudes of students from a University of Technology are particularly interesting.

Consequently, the objective of this study is to explore how role models influence students' career path decisions at Polish technical universities, with the example of Gdańsk University of Technology. Formal literature proved that role models are of great importance, especially for students at the secondary school level (Germeijs and Verschueren, 2006). However, few researchers have addressed the question of the later influence of role models on students during their university education. Therefore, this study focuses on the role models occurring both before and during university studies. As others' influences can be both positive and negative, this study also examined negative characteristics that students considered discouraging about their role models. Moreover, this study also aimed to explore the motivation behind students' choice of major, as well as the connection between internal or external motivation and vulnerability to role models' influence. Finally, this study attempted to link the impact of role models on students' intentions to sustain their career path of choice. Understanding this will demonstrate the real impact of *'role models'* on students' professional lives.

2. Literature Review and Conceptual Framework

2.1 Theoretical Framework

This study was developed based on three theories: Social Cognitive Learning Theory (SCLT) (Bandura, 1977), which posits that people learn by observing others; Expectancy-Value Theory (EVT) (Eccles et al., 1983), which suggests that people choose activities they believe they can succeed in; and the Theory of Planned Behaviour (TPB) (Ajzen, 1991), which states that intentions often lead to actions. Together, these theories provide a

framework explaining how role models influence students. Following the TPB, people tend to engage in actions they see as valuable and believe they can succeed in (Lauermann et al., 2017). The primary driver behind people's actions is their intention toward specific behaviors—the desire to perform them and the effort invested—which, when strong, generally increases the likelihood of enactment (Ajzen, 1991). Role models can shape intentions and behaviors—after observing others' actions in certain situations, individuals are likely to imitate those behaviors accordingly to SCLT, especially if they have been rewarded or led to positive outcomes (Nabavi and Bijandi, 2012). Role models enhance students' expectations of success—provided the role model is attainable, the aspirant believes they are also capable of achieving similar success (Gartzia et al., 2021). Efficacy expectations, in light of EVT, significantly impact goals, activity choices, and persistence, which in turn influence occupational decisions (Eccles and Wigfield, 2002). Thus, all three theories support the idea that role models influence students—they can shape students' beliefs, task performance (Gladstone and Cimpian, 2021), career aspirations (Eccles and Wigfield, 2002), and occupational intentions. Role models contribute to a positive attitude toward certain fields, influence subjective norms and expectations regarding specific behaviors, and boost perceived behavioral control by demonstrating successful outcomes.

2.2 Role Models and STEM

Role models embody three functions: behavioural model - an example of how to perform a skill or achieve a goal, representation of the possible - living proof that the goal is achievable, and inspiration - an indication of which goals should be considered desirable (Morgenroth, Ryan, Peters, 2015). A person choosing their role model based on what they consider valuable, as well as the goals they want to achieve, is defined as a role aspirant (Morgenroth, Ryan, Peters, 2015). Given the technical character of the university, the science, technology, engineering, and mathematics (STEM) fields are of particular interest for this study, especially given their decline in career intentions (Luo et al., 2021). This is because of negative stereotypes about STEM (Van Tuijl and Molen, 2016), as well as students having doubts about their abilities to perform well in STEM-related activities and the possibility of achieving success in these careers (Luo et al., 2021). Furthermore, gender roles contribute to a psychological barrier, causing an underrepresentation of women in male-dominated fields, such as STEM and top leadership positions, as well as an underrepresentation of men in communal roles traditionally tied to women, such as healthcare, early education, and childcare (Olsson and Martiny, 2018). What is more, representatives of underrepresented genders in specific fields suffer not only from the block of interest, career performance, and advancement in those fields, but also decreased exposure to role models (Croft, Schmader, Block, 2015). However, role models can help diversify STEM, as exposure to them is motivating for students regardless of demographic (Gladstone and Cimpian, 2021). What is not known is the long-term influence of role models; thus, this study aimed to explore the impact at both the secondary school and university levels.

2.3 Career Path

The term "career path" refers to a group of individuals' career sequences—the progression of work positions within an individual's occupational history (Joseph et al., 2012). Adolescence is a vital phase in career path selection, as it is when individual career inclinations emerge (Lauermann et al., 2017). Germeijs and Verschuere (2006) found that most decision-making regarding study choice occurs during the last year of high school. Internal and external factors are both important in choosing a university, as they shape the general expectations of student life (Chapman, 1981). According to Carpenter and Foster's tri-dimensional career choice model (1977), the most important factors include: intrinsic factors, such as self-interest in the field, self-image, individual; extrinsic factors, such as the expected level of salary, job security, the possibility of career advancement; and interpersonal factors, such as influences of family, friends, and professors. So, the study methodology follows this model.

3. Methodology

The study targeted students of Polish technical universities, and, as the Author was a student of Gdańsk University of Technology (GUT), and the study was a part of the Author's bachelor's thesis, the convenience sampling method was used; therefore, data collection took place at Gdańsk University of Technology. The sample was designed so that the representation of women, men, and faculty was equal: four men and four women from all eight GUT faculties, for a total of 64 interviews. For the qualitative exploratory nature of the study, semi-structured interviews were conducted with willing participants, individually or in small groups, to align with students' convenience and availability and to secure their physical and psychological comfort. The students were asked about the reasoning behind their study choice, the presence of role models before and during university studies, as well as the presence of anti-role models, the qualities of such persons, and their

future career plans. The study level of representatives ranged from the second to the sixth semester of the first degree of studies. Data collection took place from the 25th of February to the 20th of May 2025.

The gathered data was transcribed and prepared for analysis, with the exclusion of inappropriate language and data anonymization in order to protect the identities of participants and mentioned persons. Then, the interviews were interpreted, considering the theoretical frameworks of SCLT, EVT, and TPB, and an abductive reasoning approach was applied (Magnani, 2011) to extract the meaning. After familiarizing herself with the obtained material, the author developed a coding system based on themes that were recurring in students' responses. Subsequently, after comparing with findings provided by the literature on the subject of study selection, those codes were further aggregated into categories based on the nature of the factor behind the choice.

4. Results and Discussion

Presence of role models: The author decided to distinguish between two types of role models according to their character in the study decision-making process. Those types were: pre-university role models (pre-RMs), who had an impact on students before starting their education at university and during the process of selecting their study major, and current role models identified at GUT (GUT-RMs). Pre-RMs included students' peers, past teachers, particularly secondary school teachers, and family members. Among the pre-RM category, most students considered a family member to be their role model, with the majority referring to their parents, significantly fathers, who were mentioned 3 times more often than mothers. Other family members included siblings, aunts, uncles, grandfathers and godfathers. The GUT-RM category included current professors and peers. Professors were mostly regarded in the behavioural aspects of being a role model, with students respecting their knowledge, teaching abilities, and the overall 'approach to the student'. However, peers were mostly associated with the motivational aspect of being a role model, as respondents reported being more hopeful about the possibility of achieving their educational goals after considering that their peers also managed to attain similar achievements. Moreover, the fact that someone studies among other clever colleagues increases their overall satisfaction from being one of them. At this stage, the community of exceptionally intelligent students can be seen as a large set of peers, role models inspiring one another.

Anti-role models: The author asked the respondents about anti-role models, further referred to as "anti-RMs", who were considered the antithesis of a role model and discouraged students from pursuing certain majors. The author decided not to differentiate between pre-university anti-RMs and current anti-RMs at GUT, as the educational stage in which anti-RMs occurred made no significant difference in the way that students responded to their impact. Students mostly described their experiences with anti-RMs as either personally being a victim of their unprofessional behaviour or generally assessing the area associated with the anti-RM as not appealing. The most frequently mentioned group of anti-RMs were past teachers, who often offended respondents with rude remarks suggesting their lack of ability or, more generally, warning students that their area of study is not worth pursuing because students lack the ability to pursue it. Other anti-RMs included: current professors, family members, peers, and representatives of the field. Observations suggested that female and male respondents were of similar likelihood of having a role model influence. However, male respondents seemed more likely to be positively affected by interactions with role models, while female respondents were more likely to be negatively affected by anti-role models. The majority of the role models mentioned by both female and male respondents were male, a tendency that appeared in both pre-RMs and GUT-RMs. Most of the quoted anti-RMs were also male. Students have overall reported having been impacted by a male 2.25 times more often than by a female.

Reason for study choice: In accordance with the research findings provided by Chapman (1981), two main categories were considered: intrinsic and extrinsic factors. There were no major gender differences in reason for study choice, with both female and male respondents being mostly motivated by intrinsic factors. Intrinsic motivation refers to the direct characteristics and values of the student. For the majority of the students, the reason for their study choice was interest in the subject (major being connected with personal interests and passions), as well as being curious and drawn by the study offer. Respondents motivated by intrinsic factors have been found unlikely to also consider social influences. As for external factors, those came from the student's environment, including: pragmatic factors - connected with the critical analysis of the environment, opportunities, and students' abilities, social influence - the effect of other persons on the respondent's decision-making process, institutional factors - fixed characteristics of the organization, and exploratory motivation – for students unsure about which study major to pursue. Regarding social influences, the "suggestion from others" theme appeared 2.6 times more frequently than "oppositional choice", which suggests that respondents were

more likely to be positively influenced by others, rather than react negatively and eliminate the possibility of selecting a major associated with the other person. As for institutional factors, 8 out of 64 students reported having a preference for studying at GUT, which in most cases was caused either by the perceived prestige of the university or the technical profile of the university being connected to graduating with an engineer’s degree. Students have reported perceiving having a diploma of graduation from GUT as more valuable and providing more practical opportunities for future jobs than diplomas from other educational institutions in Gdańsk.

Regarding *interpersonal factors*, students reported that the exceptional quality of their peers enriches their experience and deepens their sense of the career path they have chosen and of belonging to such an intellectually prestigious community. Table 1 presents the summary of the reasoning behind the study choice.

Table 1: The number of mentions of reasons for study choice

Reason for study choice			Female	Male	Total
Extrinsic motivation	Exploratory motivation	Unplanned decision	2	2	4
		Trial	4	2	6
	Institutional factors	Localization	1	3	4
		Preference for GUT	3	5	8
	Social influence	Suggestion from others	8	5	13
		Oppositional choice	3	2	5
	Pragmatic factors	Income	3	4	7
		Similarity to preferred major	8	4	12
		Future opportunities	6	5	11
		Process of elimination	2	5	7
Low difficulty		1	4	5	
Intrinsic motivation	Long-term goal		4	6	10
	Interest in the subject		16	17	33
	Aptitude		0	2	2

Key qualities of role models. Those qualities are understood to be key factors that make a regular person be considered a role model by the role aspirant. Positive qualities of role models were comprised of five subcategories: character, referring to the role model’s intrinsic characteristics; influence on the respondent, referring to the relationship between the role model and the role aspirant and how the student felt affected by the role model; relatability, referring to the perceived relatability of the role model to the student; representation of the possible, referring to the qualities regarding success that students found appealing; and competences, referring to the perception of role model as qualified and skilled. The most valued quality overall was the ability to convey knowledge, closely followed by consideration and empathy, respondents’ admiration and respect, and similarity of the field. Those qualities correspond to the aspects crucial to becoming a role model: being a behavioural model, being relatable to the role aspirant, and being considered an example worth following. Table 2 shows the summary of role models’ features.

Table 2: The number of mentions of role models' qualities

Role model qualities			Female	Male	Total
Positive	Competences	Interactions with students	3	0	3
		Leadership skills	0	3	3
		Ability to convey knowledge	10	7	17
		Experienced	3	3	6
		Intelligence & knowledge	6	5	11
	Representation of the possible	Engaging career	5	1	6
		Proven success	5	3	8
		Own business	3	1	4

Role model qualities		Female	Male	Total
Relatability	Similar field	8	5	13
	Early-career relatable	0	3	3
	Shared educational background	4	6	10
Influence on the respondent	Example to follow	6	7	13
	Educational impact	3	3	6
	Inspiration in taking new goals	3	3	6
	Motivation in hardships	3	5	8
	Admired and respected by respondent	9	7	16
	Mentorship role	4	6	10
Personality	Attitude to teaching	7	4	11
	Considerate & empathetic	4	10	14
	Dedication to teaching	3	4	7
	Helpful & supportive	3	4	7
	Passionate about subject	8	1	9
	Amiable	2	7	9
	Charismatic presence	5	2	7

Negative characteristics of “anti-role models”: This category referred to qualities that students found unappealing about their anti-RMs, which consisted of 4 sub-categories: character & behaviour, respondent’s negative perception, incompetence, and field-related features. Character & behaviour included unprofessional and offensive behaviour, discouragement, undermining the respondent’s capabilities, lack of empathy, and narrow-mindedness. Respondent’s negative perception, referring to qualities that the respondent found unappealing but were not necessarily caused by anti-RM’s negative actions, included respondent’s lack of interest in the area of study, student’s general negative opinion of the field and its representatives, and the anti-RM being an example of undesirable outcomes. Incompetence, referring to the lack of anti-RM’s teaching power, included the lack of teaching ability, being disorganized, lack of knowledge, and unreasonable requirements regarding the subject. Factors related with the field of study rather than a specific person included: advising against a difficult field of study, and lack of career opportunities and available job positions. Among the negative features, respondents’ lack of interest in the subject was the most frequent. Other important and frequently cited issues were: advising against a difficult field, and unprofessional and offensive behaviour.

Directional alignment. Directional alignment indicated whether the career the respondent planned to pursue after graduation aligned with their current choice of study. 52 out of 64 respondents were planning to take a career related to their current major, with six students considering careers both aligned and outside of their major. In total, 10 students declared a possibility of selecting a career unrelated to their major, and eight students have not decided on their future career direction. There were no major gender differences in the directional alignment of careers.

Preferred fields. The jobs that students were planning to pursue fell into four fields based on their nature: STEM and technical fields, business and office-oriented fields, public services and specialized fields, and creative and passion-oriented fields. The majority of students chose careers in STEM and technical fields, which included: design & construction, science, transportation, IT & programming, laboratories, engineering, and industrial establishments. This field was the most cited among both female and male respondents, as well as respondents from every faculty apart from the Faculty of Management and Economics. The majority of the students were planning to pursue careers aligned to their current majors. The areas of jobs that were cited by students were predominantly connected with the specific character of the faculty to which the particular student belonged. Business and office-oriented jobs included: business, own entrepreneurship, management, and administration jobs. This field was the most popular among students from the Faculty of Management and Economics. Public & specialized jobs included students interested in careers in healthcare and the military. Contrary to the stereotype that most female STEM students end up in healthcare-related positions, this option was more popular among male than female respondents. Creative and passion-oriented jobs referred to jobs that had sources in students’ hobbies rather than their university majors. Interestingly, not every hobby mentioned was

considered a potential career path; however, the two recurring vocational themes in this area were arts and vehicles.

Career motivation. Career motivation refers to the reasoning behind students wanting to pursue a certain career. The most cited answers in this category were: a career connected to passion, high income expectations, the process of elimination, a desire for an influential position, job mobility, being inspired by university courses, and planning to work abroad. Female respondents were most likely to cite high income expectations as their motivation, while male respondents were most likely to cite a connection to passion. There were no significant differences in reasoning between faculties.

The most frequently quoted category of factors for female and male respondents was intrinsic motivation, followed closely by pragmatic factors. Most of the respondents chose their major because of their personal interest in the subject. Those students seemed unlikely to acknowledge the possibility of others' influence, suggesting that intrinsic motivations lessen vulnerability to external factors, such as role models. Despite that, others' suggestions appeared among the most common motivations. The majority of respondents reported having been impacted by at least one type of role model. Students who had a pre-RM were most likely following the footsteps of family members, while GUT-RMs were mostly university professors. Thus, at different educational stages, students' needs are changing, and so are their role models. Analysing the results revealed that there were no significant dependencies between students having a pre-RM and GUT-RM or students having been positively and negatively impacted by a role model. Most students declared their intention to pursue the career path of their choice, regardless of whether role models had influenced them in their previous decisions. However, the TPB supports the view that the intention to behave increases the likelihood of that behaviour; the strength of intention can be increased through interactions with role models, which reinforce students' self-efficacy and perceived attainability of success. There were no significant gender differences in the likelihood of having a role model. However, male respondents were more likely to have a positive role model influence, while female respondents were more likely to have a negative experience. The majority of role models mentioned by students of both genders were male, at every stage of education, as well as most anti-RMs being male. This suggests that students feel more influenced by men than women. Similar results were obtained in Germany by Steffen and Hess (2024). However, they noted that female scientists and entrepreneurs who could serve as STEM role models were underrepresented. Since women professors are present at GUT, it is not a result of a lack of opportunity to be influenced by women; it is simply that women professors at GUT do not inspire. The issue is 'why?' – further research should bring the answer.

5. Limitations, Implications, and Further Studies

It is important to recognize this study's limitations, including a small number of participants, the specific nature of the institution, and a lack of cultural diversity among students. Thus, to make the insights gained more universally applicable, large-scale, in-depth studies are recommended. First of all, a bigger sample of students would provide broader insights. Different types of universities can be compared, as can different locations and cultural backgrounds. A further study with the same sample, conducted a few years later, would verify the long-term effects of role models. A systematic literature review is also recommended to assess what is known about this subject thoroughly and to inform further studies.

The findings of this research can be helpful for academic advancement. The findings regarding reasons for study choice can be used to improve the existing educational offer. Educators can use findings on role model types and their qualities to improve the efficiency of their teaching methods, maximize learning outcomes, enhance communication with students, and avoid becoming a negative influencer. Mentoring systems could also use the collected data to guide students' decision-making.

6. Conclusions

This study revealed that the influence of role models on career path selection changes as the path progresses. At earlier stages, students look for inspiration to take on new objectives. Their family members can help them judge which careers are worth pursuing and that lead to successful outcomes. However, in later stages, such as university, when students already know which goals they are pursuing, what is more needed is motivation in the face of hardships and access to knowledge and valuable skills, which can be found in university professors. The most important qualities of impactful role models include relatability, success, the ability to convey knowledge, and competence. However, students' lack of interest in a particular field and professors' unprofessional and offensive behaviour can diminish the role model's relevance. Moreover, most students were motivated by intrinsic factors when choosing their majors, thereby reducing their vulnerability to external influences such as

role models. However, the revealed bias of 'independent career choice': students' 'need for independence' is extreme, so they declare independent choices, but at the same time can clearly name people who inspired these choices; this suggests that future studies should be designed thoroughly to detect this strong 'need for independence' bias.

In short, most students plan to pursue careers aligned with their majors, regardless of whether they have a role model. What is interesting is that, while in most cases there were no significant gender differences in students' answers, this study revealed a much greater impact of male role models — both positive and negative — than that of female role models. Thus, exploring this phenomenon more in depth is an interesting direction for future studies.

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AI declaration: No AI tools were used to write this paper.

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