

Impacting IT Enrolments: What Factors Most Influence Student Career Decisions

Rohan Genrich
School of Management and Enterprise
University of Southern Queensland
Queensland, Australia
Email: rohan.genrich@usq.edu.au

Professor Mark Toleman
School of Management and Enterprise
University of Southern Queensland
Queensland, Australia
Email: mark.toleman@usq.edu.au

Dr Dave Roberts
School of Management and Enterprise
University of Southern Queensland
Queensland, Australia
Email: dave.roberts@usq.edu.au

Abstract

This paper reports preliminary data on factors influencing student perceptions affecting their decision to study information technology in later years of high school and at university. Factors from the literature mainly align as social or structural. This research has found that structural factors (curriculum and teachers) have the most influence on student decision making about course selection related to IT subjects. Subsequent research will experimentally examine curriculum changes and teacher preparation for improvements of student perception about IT subject selection and IT careers.

Keywords

IS Curriculum, Educators, IS Careers, Student Perceptions, Circumscription.

INTRODUCTION

The number of students enrolling in Information Technology courses in senior secondary schooling (years 11 and 12), TAFE and Universities has shown significant decline over the last ten years, with only a marginal increase in the last few years in the University sector partly due to initiatives such as local University interaction with schools in their regional catchments. Most of the research to date on reasons for this decline has focused on the more specific analysis of why girls are not taking Information Technology courses in Senior Secondary Schooling, TAFE and Universities.

This research advances the understanding within the Information Technology discipline into the poor perceptions that middle school secondary education students (years 8 to 10) have of the Information Technology discipline and careers. It investigates what type of Information Technology content is being taught in middle school, the teaching methods being employed to deliver this content, and the impact that this content and delivery has on the perceptions that middle school students have of the Information Technology discipline and careers.

The ultimate aim of this research is to propose methods to increase the size of the future cohort of students taking senior Information Technology (Information Processing and Technology, and Information Technology Systems) courses, and Tertiary Information Technology degrees (TAFE and University) by improving student perceptions.

The initial stage of this research investigates the social and structural factors considered to impact on student perceptions. This research was undertaken through the use of focus groups and a survey involving recent high school graduates, to seek corroboration as to the impact these factors have on student perceptions of Information Technology. Once these findings are substantiated, the second stage of the research will be to investigate more appropriate Information Technology curriculum for middle school students and teaching methods that have the highest potential to impact raising the perceptions of the Information Technology discipline and careers in secondary education students.

BACKGROUND

Downes and Looker (2011) have examined the factors that influence students' plans to take computing and information technology subjects in senior secondary school. Lynch (2009) has examined the ongoing challenges of gender and the study of information technology. Reid (2009) has examined the declining participation in high school computing studies in Australia, and an ALTC project was undertaken in 2005-2007 into Gender and IT (Lynch 2009).

The key findings from all of these studies have been that student perceptions play a significant role in students' subject selection, and the experiences of middle school secondary IT subjects. Typically these subjects are delivered by teachers with limited expertise or experience of IT and are constituted of mundane, repetitive tasks which plays a major role in the development of poor perceptions of students going forward into senior secondary education and tertiary education.

Gottfredson's (2006) Circumscription and Compromise Theory identifies four career developmental stages in a students' life where they progressively discount career alternatives that do not meet their image of self (circumscription), and amend their self-image to accommodate real world constraints in favour of other career alternatives (compromise). The third stage focuses on students in middle secondary school. During this stage students eliminate from further consideration any career path that they see as too low in prestige or that seems out of reach in terms of ability or effort required. The final stage focuses on students in senior secondary school, tertiary education, and earlier careers. By this final stage students are only considering those careers that have not been rejected in the third stage.

The challenge that this places on IT education and the IT industry is that with students' perceptions that IT is seen as mundane and repetitive, many are eliminating from consideration a career in IT during these middle schooling years through circumscription and once this occurs it is very challenging to reverse.

Increasing a student's self-efficacy of IT, the belief that they have the capability to perform IT tasks, is an important construct in a students' self-image (Bandura, 1997). Brown & Lent's (2012) Social Cognitive Career Theory (SCCT) highlights the importance that self-efficacy, as well as outcomes expectations and other personal and environment factors (e.g. gender, culture, barriers, and supports) play in shaping a student's self-image. SCCT examines the conditions that can limit or strengthen the ability to influence student's self-image. Personal, environmental and learning experience variables are seen to influence a student's interests and career choice goals.

Adya and Kaiser (2005) discuss how these variables can be examined as the social factors (e.g. family, peer group, and media), and the structural factors (e.g. teachers and curriculum). Each of these factors can play a role in either strengthening or limiting a student's self-efficacy and also their outcomes expectations of IT careers, leading to career choices.

This paper examines the importance which students perceive that these social and structural factors played on their senior schooling subject selection and career decisions.

METHODOLOGY

Focus Group

An initial test of the factors that influence perceptions of IT and IT Careers in Queensland students was conducted through a focus group. The focus group was comprised of nine first year business studies students, who had not yet attempted and were not currently enrolled in the compulsory core business computing course. They had purposely postponed the study of any computing course at tertiary level. This group was asked the following questions prior to the focus group:

1. What is your age, when you graduated High School, and whether you went to a Public or Private High School?
2. What degree and major(s) are you currently studying at University?
3. What was the highest level of IT studies you did at High School?
4. On a scale of High / Medium / Low what would you say would be your level of IT skills?

During the focus group the aim was to determine the key influences on a students' decision as whether or not to pursue further studies and a career in IT.

Based on the literature, the following factors were explored with the focus group:

1. Parents and family.
2. Friends.

3. Year 8, 9 or 10 teachers.
4. Year 8, 9 or 10 IT courses.
5. Media such as movies, TV, magazines, computer games.

Finally the group was asked “What other issues do you think had an impact on your decision whether or not to take any IT subjects in year 11 or 12, or to pursue a career in IT?” and asked to then rank the key influences from 1 to 5.

Survey

Due to the limitations of the focus group size, it would be unwise to generalise on such a small number, consequently a survey was conducted after the focus group data was analysed to further examine the views expressed within the focus group. The survey was conducted using a representative sample of the compulsory core business computing course. It was set as part of an in-class exercise which all students were asked to complete. Attendance during these class sessions was within the expected range based on historical data. While not all students were present for these sessions, it was felt that those in attendance were representative of the cohort. The class was composed of 39% students studying Business Studies, 34% students studying Commerce, 4% students studying Education, 18% students studying IT, and 5% students studying the Sciences which is typical of this foundation level computing course.

There were 49 respondents who completed the survey and 5 respondents who partially completed the survey, and this was a representative sample of the population. Students were asked their gender, the year they completed secondary school, and 6 questions for each of the five key focus impacts from the focus group questions. The final activity asked the student to rank the factor in relation to their personal decision to consider an IT career. Students were also asked to rate how important each of the five key influences were on their decision to study at university.

ANALYSIS AND DISCUSSION

Focus Group

In the focus group only one student had continued into a senior computing course, Information Technology Systems (ITS). This student initially applied to do Information Processing and Technology (IPT) but their School had opted to switch to ITS, dropping IPT. The student’s impression was that the teacher was out of their depth with the subject.

Students’ impression of middle school computing fell into two categories: 1) basic computing skills, little relevance and teacher with limited skills. 2) Programming course, little relevance but great teacher.

Relevance was one of the key discussion points, and both categories above provided little benefit to the students’ understanding of what a career in computing was about. The programming course category students had the impression that it was all about software development.

Students did not feel that the media played any role in their non-continuation of IT in senior, nor at university. They felt that family played some role, as did friends. The “geek” label was not seen as a concern.

The transcript for the Focus Group was entered into Nvivo for analysis. Eight-four comments were made by he students. These statements were categorised according the social and structural factors as shown in columns in Table 1. The number within parenthesis after the factor eg. Career (11), indicates the number of comments concerning each factor. The comments represent the view of all participants, with no individuals dominating the group. The Teacher and Curriculum factors generated more comments than most of the other factors. All comments were coded into a scale ranging from high positive or low negative responses. These responses were further weighted (high – 3; medium – 2; low – 1) to produce a weighted positive and negative score shown in the bottom rows of Table 1.

Table 1: Coded and Ranked / Weighted Focus Group Responses

	Career (11)	School (8)	Family (4)	Teacher (21)	Curriculum (24)	Media (7)	Peers (9)
High +			1	1	1		1
Medium +			1	3	6		3
Low +	3			1		2	1
Low -	4	3		2	4	3	2
Medium -	3	2	1	9	8	2	1
High -	1	3	1	5	5		1
Ranked / Weighted Responses:							
Positive	3	0	5	10	15	2	10
Negative	-13	-16	-5	-35	-35	-7	-7

Figure 1 highlights the views expressed by the students for all the factors. Most comments were made about year 8 to 10 teachers and the curriculum taught in these year levels. Comments were both negative and positive about these two factors. In the text below direct quotations from students are shown in italics.

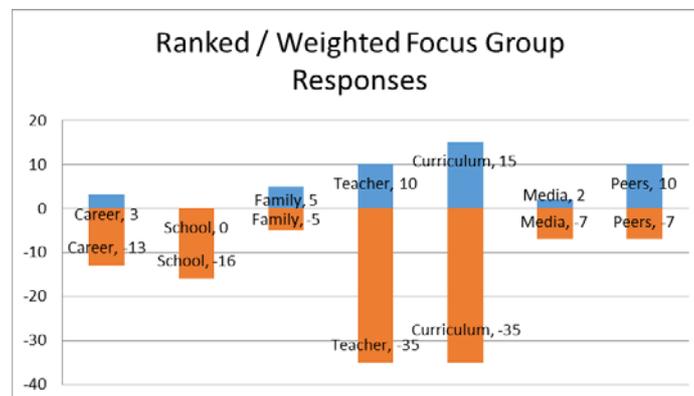


Figure 1: Ranked / Weighted Focus Group Responses

The nature of teaching in Queensland high schools is that the IT specialist teachers are focused on the senior classes. Most teachers are asked to teach four to five classes a semester, dependent on other duties such as maintaining school networks, computers, and websites.

My programming teacher was actually organising stuff at the school, like he was almost half running the school, so he was involved in a lot of the technical stuff and everything like that.

Students who are fortunate to have one of these teachers for middle school classes have provided some strong positive responses to the impact their teachers had on them:

I had a really good teacher in year 9 and 10, they were actually experts in the field, they are constantly [learning about IT] so I was exposed to good knowledge so whenever you had a problem ... it made it interesting because we were not just doing the same boring things, we were doing a bit of everything.

The depth of the skill set of some of these teachers is evident in the following response:

... the actually technical stuff they were all very good, if they were using it they were really good teachers, I couldn't fault them with what they were saying. They knew their stuff, like [one of my teachers] was an ex-engineer and the ... was teaching me AutoCAD, he actually sat ... on the board of Autodesk and so all this information was dropped into you.

With the limited number of qualified senior IT teachers in each school, there is limited scope for these teachers to also cover the more numerous junior and middle school IT classes, resulting in many schools co-opting other teachers into these classes. This is evident in the following strong negative response:

My teacher was ancient, she taught some of my friend's parents. So she really wasn't engaging at all – we learnt out of a book, she just sat up the front and said “ok follow the book”. So she wasn't engaging, she was old, didn't encourage us at all. So I think that would be one of the reasons [not taking any IT] as well. She did teach some of the teachers as well, so was so old.

Another strong negative response regarding inexperienced teachers was:

In years 8 and 9, the IT teachers I got were not ... they weren't IT teachers, they had to teach out of a book, because they really didn't understand the concepts and you know, I really don't hold it against them but it just wasn't that engaging.

Whether through poor understanding of the IT industry or due to a large number of these junior and middle school IT teachers deriving from other disciplines, the focus group responses also indicated that there was little, or more alarmingly, negative encouragement for these students to consider IT as a career. Gottfredson (2006) indicates that career circumscription occurs with students in these year levels, whereby they are actively dismissing careers, most of which they will continue to dismiss into their working lives.

... just the perception you get off teachers is that [IT was] not that interesting, it's not a proper career, so I got the idea off teachers that accounting or being the head of business is a better option, or even the histories and stuff are more encouraged in schools, even though now I might think IT is a better way to go than history type subjects at school. That's kind of why I never did it through school and why I am not doing it now.

Students are required to limit their course options at the end of middle school. Their choices of subject selection for senior are impacted by their teachers.

I was trying to do as much science subjects as possible so I could get into what I wanted to and it wasn't encouraged to think of IT as a career choice which would have led to you not selecting it as a line choice as well.

The National Curriculum is still evolving; the Information Technology area (Prep – Year 10) is still in draft form and has not been implemented in Australian schools. In Queensland, over the past decade, middle school curriculum has been left up to individual schools. The focus has been on the primary curriculum, especially to meet the Naplan requirements, and the specifications imposed on senior classes by the Queensland Curriculum and Assessment Authority. This has resulted in a diverse range of curriculum design for schools, dependent on the skills of the teaching staff. Schools with skilled computing teachers focus on high end skills, such as programming, multimedia and game design.

For the IT we did up to year 10 we didn't do PowerPoint or anything like that, we pretty much did programming, so we made programs, animation and that type of stuff, even games

Website design is also taught in some schools.

I can't remember too much about year 8 but year 9 it was all kind of fun stuff, designing and website design which was very good. After we started game programming, we were just programming in general as well, the languages we kind of used throughout...

The downside of this type of curriculum is with providing students with access to the software necessary to complete tasks. With limited class time due to heavy class loads (most middle school students do seven or eight courses concurrently), students often need to complete activities in their own time at home. Programming languages and multimedia packages can be cost prohibitive for students' home use.

... and on top of that the projects we were doing couldn't be done at home because they rely on the software that were on the computers at school which was very frustrating so you couldn't catch up if you got left behind because you didn't understand the content because the classes were such a nightmare to be in and on top of that the project we were doing if you had a mistake at the start would affect the end result dramatically, if you couldn't an issue – no project.

In schools where the skilled IT teachers are not involved in the middle school curriculum, the co-opted teachers often rely on more basic curriculum, often drawn from past business curriculum for these classes, such as basic skills in word processing, spread sheeting, and presentations.

I think it was just working through different programs like Excel, PowerPoint, Word. There was a lot of stuff that was taught that I've never used since then and it was really hard to learn anything or get enthused by it because of how it was set out.

Students are often already proficient in these basic skills, having been exposed to these programs in primary school and through home usage.

We just used PowerPoint, Excel, we did some Word, then we kind of moved on in year 9 to more like website design, which we got into and it was really fun but it never really progressed from there.

Through the continual reinforcement of these basic skills in the curriculum, Gottfredson's (2006) career circumscription is occurring; they are actively dismissing IT careers as they find IT uninteresting.

We basically went through the entire Microsoft Office suite which [sarcasm] was such an interesting and exciting learning experience. So year 8 was basically PowerPoint ... Word, year 9 we did a little Access.

Survey

The views expressed within the focus group were further investigated through a survey of other students currently enrolled in business studies. The survey respondents were comprised of 43% males and 57% females, the respondents completed secondary school between 2002 and 2013, with 63.83% of students completing in 2013 and 78.72% completing since 2012. For each factor, students were asked to indicate their level of agreement (positive; neutral; negative).

The first set of questions related to their Information Technology Teachers in years 8 to 10.

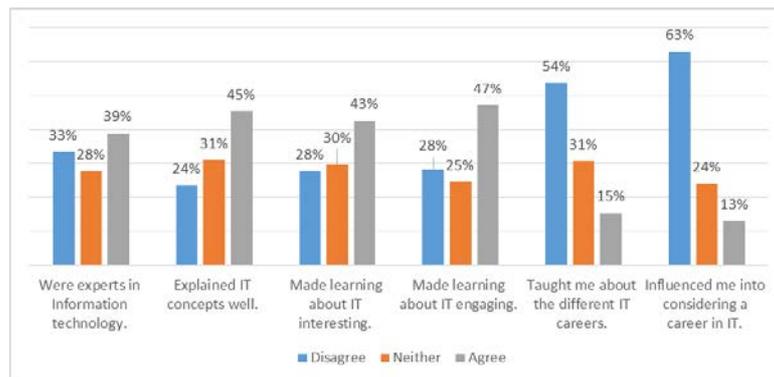


Figure 2: Information Technology Teachers in Years 8 to 10

The responses captured in figure 2 reveal the difference of opinions that students have about their teachers' skill set, with 39% agreeing that their IT teachers in middle school were experts in their field and 33% disagreeing. This supports the focus group responses that there are two distinct groups of teachers involved in these classes – strong domain specialists and co-opted teachers with limited background.

Only 45% of the students felt that their teachers were able to explain IT concepts well; 43% felt that their teachers made learning IT interesting; and 47% of the students felt they were engaged in the learning experience. These results indicate that there is scope for considerable improvement by many of the teachers.

The second set of questions related to their Information Technology Curriculum in years 8 to 10.

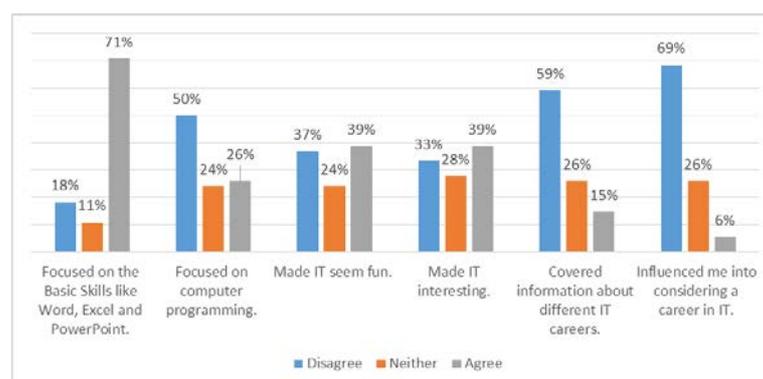


Figure 3: Information Technology Curriculum in Years 8 to 10

Figure 3 depicts a large proportion (71%) of the survey respondents agreeing that their IT subject(s) focused on basic skills like Word, Excel and PowerPoint. However, contrary to the focus group, only a small number of respondents (26%) indicated that there was an emphasis on computer programming. With such a split between domain specialists and co-opted teachers, it would be expected that this would be closer, but may indicate that even the domain specialist teachers are focusing on more basic skills to these middle schooling classes.

Only 39% of the students found the year 8 to 10 IT subjects enjoyable and interesting. Even the most dynamic teacher would struggle to stimulate students with uninspiring content. An obvious omission in these IT subjects

was any coverage on IT careers; only 15% of the students felt that their middle school teachers had provided them with any insight into possible IT careers and this is consistent with the 15% of respondents who indicated that this was included in their years 8 to 10 syllabus.

Consequently it is of little surprise that 13% of the students felt that their teacher(s) influenced their decision to consider a career in IT (Figure 2) and a very small 6% indicated that their middle school IT subject(s) had any influence (Figure 3). That is, students have not chosen a career in IT, and the curriculum and teacher(s) may have influenced this decision.

Without discussion about the nature of IT careers and with such limited encouragement from these teachers to consider an IT career, according to Gottfredson's (2006) there is a concern that students will discount IT as a career, avoiding selecting it as a subject in senior and tertiary studies.

The third set of questions related to their Family (Parents, Siblings and Relatives).

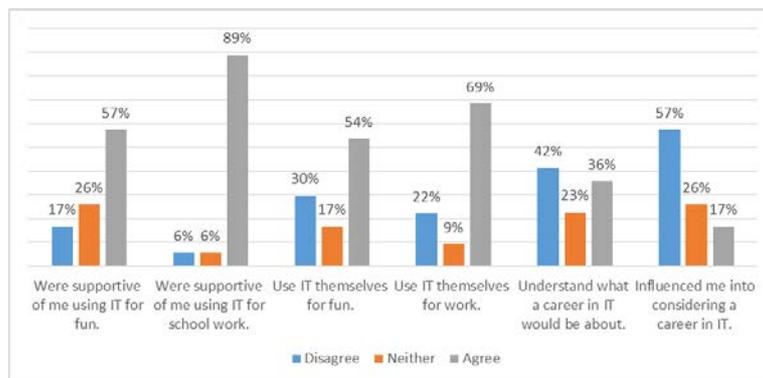


Figure 4: Family (Parents, Siblings and Relatives)

Parents and family are considered to play an important role in a student's career decision making (Dryler 1998; Barker and Aspray 2006). Figure 4 indicates that a slight majority parents and family (57%) found it acceptable to use IT during students' leisure time but a greater proportion (89%) encouraged students to use IT for school work.

According to the respondents, a marginal majority of students' parents and family are actively using IT in their own leisure time (54%) and for work (69%). In our technological world this is not unexpected. We use IT in every facet of our lives, and parents would understand the importance of encouraging their children to utilise these technologies in all aspects of their schooling.

With the limited impact that teachers and the middle schooling subject(s) are having on student's encouragement to pursue an IT career, family should play a strong role to encourage students to consider IT as a career path. Unfortunately, the survey responses indicate that a small proportion of families understand the nature of IT careers (36%) and an even smaller percentage (17%) encourage their children to consider an IT career.

The fourth set of questions related to their Friends at School.

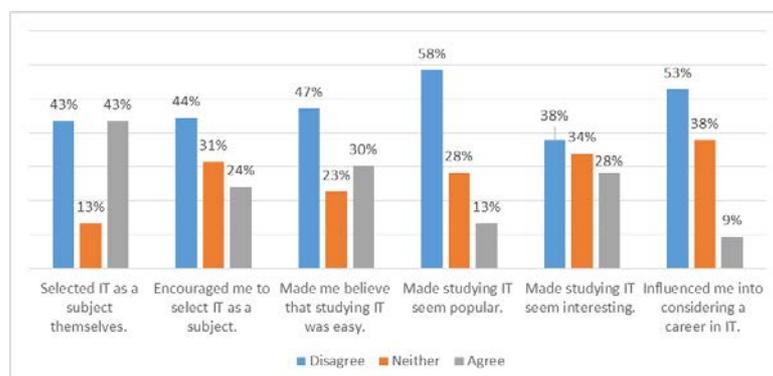


Figure 5: Friends at School

Friends and peers are considered to also play a role in a student’s career decision making (Barker and Aspray 2006; Henslin 1999). Figure 5 indicates that there little support offered by friends and peers towards studying IT. Less than half (44%) were encouraged by their friends to select IT courses. These IT courses were popular with only 13% of their friends while 30% suggested that studying IT was easy, but it was disappointing that only 28% found it interesting.

Respondents reported that their friends and peers had limited influence (9%) on their decision to undertake further IT studies. With low enrolments in senior IT classes, scant incentives from year 8 to 10 teachers and subject(s), and little encouragement from parents, it stands to reason that the students themselves would not be supporting each other to consider a career in IT. The proposed National Curriculum for the Information Technology area (Prep – Year 10) will hopefully address some of the concerns about teacher motivation and curriculum once it has been implemented in Australian schools.

The fifth set of questions related to the Media (TV / Newspapers / Magazines).

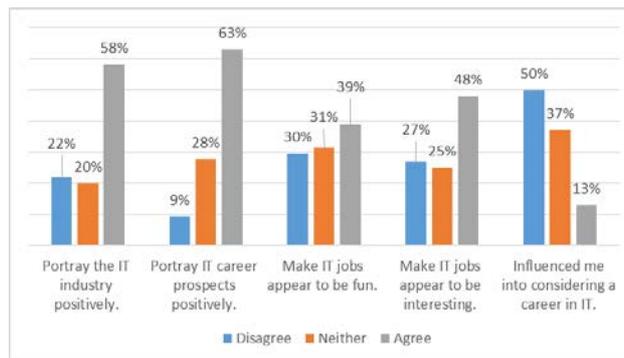


Figure 6: Media (TV / Newspapers / Magazines)

There is a perception that the media overly portrays the IT industry in a negative light, especially in terms of offshore outsourcing of jobs, but this does not seem to be reflected in the responses from the survey. When asked whether the media had any effect on students’ positive or negative understanding of the IT industry and IT careers, marginally more than half (58%) felt that the media portrayed the IT industry positively, with 63% of respondents suggesting a positive portrayal of IT careers. Unfortunately, less than half of the respondents (48%) believe that the media portray an IT career as interesting and even less as fun (39%). It would be desirable, especially for Generation Y, if these figures were considerably higher.

There is a perception that students are not engaging with mainstream media, rather they are getting their information from social media sources. The survey indicates that the media is having limited influence on these students to consider a career in IT (13%). More effort in promoting IT careers may be needed by professional bodies, such as the Australian Computing Society, in the social media arena.

The final set of questions focused on the influences to their overall decision of what subjects to study at university (Figure 7).

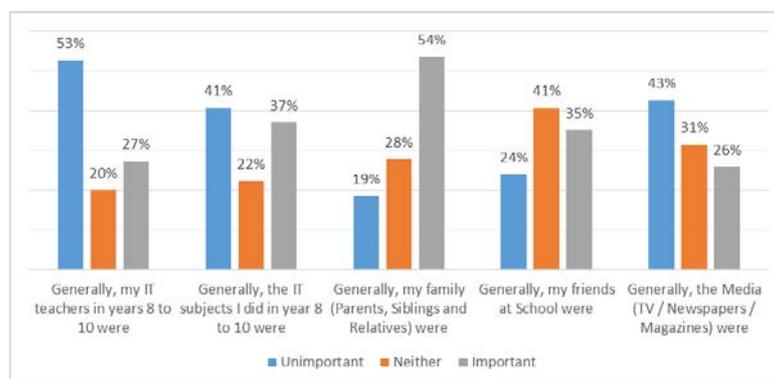


Figure 7: Decision of what to Study at University

The survey concluded by asking students to rank the importance of each of the factors above on their decision of what to study at university. From the responses (Figure 7) families were the most important (54%), followed by IT subjects (37%) and friends (35%). Student's felt that teachers were less important (27%) and the media had the least importance (26%). While it is understandable that families have the greatest influence, the area that might be most easily changed by educators is the content of the IT subjects, and consequently this should lead to a greater influence from the IT teachers.

CONCLUSION

Despite the opportunity provided by schools and teachers for middle school students by way of classes in Information Technology, and the encouragement from parents to use IT in all aspects of their schooling, the middle school students are not undertaking further studies in IT. Therefore, an opportunity exists to explore the possibility of influencing the structural factors (teachers and curriculum) to attempt to increase the uptake of IT courses by students in senior secondary school or tertiary level thereby increasing the number of students launching a career in IT.

The next stage of this research will be to investigate more appropriate Information Technology curriculum for middle school students and teaching methods that have the highest potential to impact raising the perceptions of the IT discipline and IT careers in secondary education students. This curriculum will be trialled in a number of Queensland middle school classes, involving both private and public schools, where student's perceptions will be pre- and post-tested to ascertain the impact such a curriculum has on their perceptions.

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