

Challenges associated with teaching mathematics for social justice: Middle Eastern perspectives

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Abstract

This study involved a group of Middle Eastern Muslim women (ages ranging from 16-36) learning mathematics through social justice pedagogy. One of the important lessons from this experience is that, despite some of the unique challenges associated with teaching for social justice, in this context this method of teaching is doable and beneficial. However, in the current atmosphere throughout the Middle East it is a very challenging task: it needs courage and commitment on the part of the teacher/researcher, as well as support and even protection by the head of the college or policymakers to ensure that it leads to positive learning outcomes.

Introduction

This paper describes and analyzes my experience teaching mathematics for social justice with a group of students at a college in the United Arab Emirates (UAE). Social justice teaching is defined differently by individuals based on their world views. For example, Cotton & Hardy (2004) define it as

a way of working that accounts for, and works with, the links between oppressions, inequalities and exploitations that we see inside and outside our schools and classrooms. (p. 90)

Tanko (2012) defined social justice teaching as a way of teaching that helps learners to understand their world better and also enables them to seek their legitimate share of the benefits in their society, while contributing to its positive development. It also includes issues of equal opportunities for jobs and income, civic participation, and information and support related to one's personal life. The social justice approach adopted here is based on the work of Gutstein and his colleagues (Gutstein, 2001, 2006; Gutstein & Peterson, 2005) in a Chicago school in the USA, which argues that engaging students in mathematics within a social justice context increases students' interest in mathematics and also helps them learn important mathematics.

In the Middle Eastern context very little work, mostly unpublished, has been done on teaching for social justice. Tanko and Atweh (2012b) reported how a group of students' mathematical knowledge improved as a result of their exposure to social justice teaching, while Tanko (2012) reported how he provided opportunities for his students to learn Practical Numeracy meaningfully while addressing some social justice issues. These two studies are probably the only published work of their kind in the United Arab Emirates (UAE) and the wider Middle East.

A number of researchers have documented some of the challenges associated with teaching mathematics for social justice. For example, Taysum and Gunter (2008, p. 187) state that

it is arguably dangerous to attempt to work for social justice in the school when the writers of policy tests are people far removed from the messiness of the day to day realities of the people whose identities they are shaping.

Gutstein and Peterson (2005) argue that social justice teaching cannot be easily done when using a rote, procedure-oriented mathematics curriculum. These quotes highlight some of the major challenges

associated with teaching for social justice: the fear of retribution from administrators who may perceive the pedagogy as a threat to the status quo, and also rigid curriculum that has little or no real connections to the learners' lived life outside the classroom.

The pressure to complete the syllabus and prepare students for mandatory examinations is a significant challenge standing in the way of teaching for social justice. The single most influential factor that stands in the way of many teachers teaching mathematics for understanding is the pressure to prepare students for exams (Lipman 2004; Lipman & Gutstein, 2001; Radical Math, 2007). Many teachers are compelled to compromise their quest for students to achieve "relational understanding" (Skemp, 1976) of taught concepts – understanding of how and why the concepts fit together – because they need to complete external examination syllabus requirements on time.

Sometimes students can add to the pressure on their teacher by insisting on completion of such a syllabus to allow time for systematic review before the mandatory examinations. Some students may even exhibit a rebellious tendency toward the teacher. As Gutstein (2006) succinctly puts it, making students think less about their end of year exam is a challenging task and requires time, because such a culture contradicts students' expectations of what teaching 'should be' – and students are not always so quick to accept this new way of teaching. Gutstein's claim is supported by a student who took part in his study (cited in Gutstein, 2006, p. 169):

When first presented with this style of teaching, I was very accepting of the manner in which we were learning math. Later in the course, my attitude toward it changed to distrust and, to a small extent, rebellion. What prompted this attitude were different factors. I remembered having a large concern and not feeling confident in being able to perform well in the required state testing that would be used by high schools in determining where one would attend.

Jacobsen and Mistele (2010), in their investigation of the challenges preservice teachers face with teaching for social justice, concluded that the major challenge was what they called the "problem of balance" (p. 8): in other words, the problem of how to strike a balance between the mathematical concepts and the social justice issues addressed in given tasks. They provided four possible manifestations of the "problem of balance": (1) the use of mathematics without mathematics instruction by the teacher, (2) the use of traditional methods of teaching and/or non-challenging mathematics, (3) trivializing of social issues, and (4) disconnect or artificial connections between social issues and mathematics.

Understanding the context of this study is vitally important because social justice is always interpreted relative to context. The context is discussed in detail in the next section of this paper, and I will attempt to clarify what are the challenges associated with teaching for social justice in this context. I address this question in relation to the challenges faced by Diploma Foundation (DF) students who, at the time of this research, were experiencing a traditional teaching approach at the Higher Colleges of Technology (HCT) in the UAE. This study focuses on three content areas, namely: percentage, time calculation and graphs. My experience from previous years shows that these topics remain a particular challenge for many DF students; furthermore, the topics lend themselves readily to student projects and have clear social justice implications. In Tanko (2012), I reported on how student projects helped to achieve better understanding of these three content areas.

Research context

The context is discussed in some detail to facilitate better understanding of the uniqueness of the place where this study was carried out.

In the UAE, the language of instruction is Arabic in all government owned primary and secondary schools. All these schools are attended almost exclusively by UAE nationals and are single gender, with only male teachers teaching at the male schools and only female teachers teaching at the female schools. Parallel with the UAE state school system are private, fee-paying schools attended by the majority of expatriate children. Here the language of instruction is English and the curriculum reflects the national origin of the institution's founders. Some Emirati children attend these schools too - many of those are children whose parents are planning to send them abroad (e.g. to Australia, the UK or the US) for their university education.

In March or early April of their final school year, all Emirati high school students in the UAE take the Common Educational Proficiency Assessment (CEPA), which assesses skills in English and mathematics. The results of this assessment determine the destination of students' post-secondary education. Those who are perceived as 'achieving' students (those with high CEPA scores) will normally gain admission into universities in the UAE, while the middle and lower ability ones tend to seek admission into The Higher Colleges of Technology (HCT). Instruction in both universities and colleges is in English.

HCT admits only Emirati men and women (again segregated by gender). At the time of this research, those admitted into HCT fell into two categories. At entry, students with reasonably good grades were admitted into the Higher Diploma Foundation Program (HDF) and the remainder into the Diploma Foundation Program (DF). During this research I taught mathematics to the DF students. In other words, I taught those who are perceived by the system as mathematically weak. Some students may start their study with HCT but leave half way into the year for a variety of reasons; doors remain open for this category of student to come back, whenever possible. During the period of the research reported in this paper, more than 50% of the population of students at college A came from outside the immediate urban area, and the college provided a bus service at a subsidised rate to students who required it. Some students were dropped off and picked up from college by their parents, or by the family driver, and some drove themselves to college. Those who drove themselves were mostly working students: they were studying full-time as well as holding down a full time job, with their working hours adjusted by agreement with their employer. Those students who caught the bus had to travel for more than an hour to get to college every morning, and some had to catch the bus as early as 05:30 because the bus driver had to pick up other students from different locations.

My choice to research the teaching of percentages, graphs and time calculations was a consequence of my experience teaching these topics using a traditional teaching approach and also because I had observed that DF students at college A continued to find these topics particularly challenging.

Methodology

This study involved a group of 20 female participants between the ages of 16 and 36 years in the DF Mathematics course. The objective of the research was to trial an approach to enhance the teaching of a course that relates mathematics to the real lives of the students, whilst addressing some social justice issues within the DF years of the HCT. During this research, I was responsible for teaching mathematics to three DF sections but I purposely chose one of the three sections, not because of their ability in mathematics but because, relative to others within the student body, the majority of the students in the chosen class had a reasonable command and understanding of both written and spoken English. Therefore, they were more likely to be able to express themselves during reflections and interviews. According to Creswell (2005), purposeful qualitative sampling permits the selection of participants or sites that can help the researcher(s) to best understand a particular phenomenon.

Triangulation (Stake, 2003) was achieved through multiple sources of data including (1) participants' test results at the end of the module (2) student presentations and reports handed in by each group at the end of their presentation (3) participants' reflective questionnaires (4) focus groups, and (5) the use of my own reflective journals. A grounded theory approach was used to analyse the data because it can allow data to speak for itself; in particular, the approach discussed by Strauss & Corbin (1998) was utilised to organise and interpret the raw data in this research.

During the data analysis process, I identified the main themes which recurred in the interviews, for example, *engagement* and *enjoying mathematics* (Table 1). These were then grouped into broader themes (Table 2).

Table 1: Themes and definitions.

Theme	Definition	Example
MPPC_ mathematics profile and positive change	Expression of liking for mathematics from the initial position of a 'math phobia' participant.	I understand math better and I want to do math all the time. I go to class early after break no late again. I don't want any break for double period I stay in class. (Afra, Reflective Questionnaire)
SEM_ student engagement with mathematics	Improved interest in: the study of mathematics and/or in engaging in college mathematical events. Substantive conversation.	Explain to me how you arrived at this ratio? From our calculations, the ratio Space: Student is actually 1:1.4 but we rounded up to make sure there will be no student without space to park her car, so the ratio is now 1:2 (Car Parking Group, Presentation)
FEM_ fun and enjoying mathematics	When participant makes a statement demonstrating happiness with the task in hand.	We are doing math with no fear like before in school. Is all fun and nice to do. This project is special for me because is different, is about car parking and I drive my car to college. (Aisha, Reflective Questionnaire)
RWM_ reading the world with mathematics	Using mathematics to better understand both local and global issues.	I like this project because we use math to understand the problem with transport to college. (Muneera, Reflective Questionnaire)
WWM_ writing the world with mathematics	Using mathematics as a tool to seek improvement of an unjust situation.	There is the need for more awareness campaign here at our college on the important role that private sector plays in the UAE economy. (Career Aspiration Group, Letter to Career Coordinator)
PS_ problem solving	Demonstrates the ability to think "out of the box" - critical thinking ability. High order thinking.	Is cheaper for me to travel by private transport but I like the college bus because I make new friends on bus, this is very important in life. (Sheika, Presentation)

Table 2: Broader themes.

Broader Themes	Sub-Themes (see above)
SJ _ social justice	RWM WWM
MT _ mathematics	MPPC PS
ATW _ attitude to work	SEM FEM

I was particularly careful to ensure that the themes which I identified reflected the participants' views rather than my own. To ensure that this was the case, I familiarized myself with the collated data by reading it several times and also by listening to the taped interviews many times. I burned the recorded interviews onto CD and played them to and from work every day throughout the period of data analysis.

As I reviewed more data, I started to create and define some as sub-topics of broader categories. Consequently, by grouping them together, I came up with a final list of universal themes in Table 2 above. I continued until I was satisfied that the themes I created were exhaustive, i.e. I was no longer generating new themes (Charmaz, 2008). As a result of this approach, I was able to identify the topics of most importance to the participants. I then collated all the phrases and whole narratives in various sub-categories and summarised the contents into key issues. I was particularly interested in statements that related one sub-category to another either in terms of influence or priority. I used direct quotations from the participants to support some of my data analysis throughout this paper.

Procedures

I began the first lesson by telling the students that I would be teaching them the topics of percentages, time and graphs using an approach known as teaching for social justice. Immediately Sarah (all names are pseudonyms), a very vocal student, raised her hand and asked, "What does that mean?" I went on to explain to them that teaching for social justice is when the teacher uses his or her subject as a tool to empower students: to resolve a potential problem or a problem that is important in their lives. The whole class went quiet for few seconds; you could hear a pin drop. This was not surprising to me because I knew this was the first time anyone had said something like that to these young women. Then Sarah broke the silence again and said, "This sound good teacher. So we can choose any problem we want to discuss and use math to solve it"? I replied, "Yes". Therefore, at the start of the project, students engaged in a brainstorming session to identify issues related to social justice that were of concern to them and which they wanted to investigate using mathematics. This resulted in three projects: *Time of Travel*, *Career Aspirations* and *Car Parking*.

The Time of Travel group was concerned with whether the means of transport provided by the college could be improved to meet the needs of students who lived outside the city. Each student in the class recorded their travel times to and from college for a week. This data formed the basis of learning mathematics as well as investigating the challenges some students faced in their travels to and from College. The Car Parking group was concerned with the allocation of parking at the College to see if it was fairly distributed between staff and students. To obtain their data, they measured the dimensions of all car parks and worked out how many cars could park at any given time. The Career Aspirations group used mathematics to investigate action needed to increase the amount of information available

to students with regards to available career opportunities. To collect data, they constructed a questionnaire which was completed by seven classes out of the nine in DF, Semester 2 at the college.

The projects were conducted in 4 stages:

Stage One (2 Weeks): Students at this stage brainstormed issues that were of concern to them or to their community. These were narrowed down to one topic which they then investigated. As the projects required novel data to be collected, students in small groups designed appropriate questionnaires and data collection sheets which they used to collect the data that they needed to inform their selected topic. 'Scaffolding' for the students was crucial at this stage due to the novelty of the task and the language support these students needed; thus I gave them the support they needed in order to avoid unnecessary frustrations. For example, the Career Aspiration group needed help on how to design a good questionnaire.

Stage Two (1 Week): The questionnaire developed by the students and used for the Career Aspirations project was typed and piloted, the data collection sheet for the Time of Travel project was designed and the students working on the Car Parking project went out into the field to measure the dimensions of car parks.

Stage Three (1 Week): All the groups tabulated their data, did the necessary calculations and then decided on the appropriate way to demonstrate their results. This stage was crucial because it was directly connected to the three mathematical concepts mentioned earlier.

Stage Four (2 weeks): The students prepared and delivered a presentation of their findings to the whole class. Each group was given 20 minutes for their presentation and this was followed by general questions and discussion for the whole class.

During the early stages of the projects, it was noted that the group discussion tended to focus less on the mathematics involved and more on the social issues under investigation. This is the "problem of balance" identified by Jacobsen and Mistele (2010). In seeking to meet this challenge, I introduced the Mathematically Enriched Worksheets (Appendix 2) to focus the students' attention on the mathematics. A separate sheet was developed to consider the data from each of the three projects. All students in the class engaged with all three worksheets: first they tackled their own group's sheet individually; then they discussed their results within their project groups; and finally each project group presented their answers to the relevant Mathematical Enriched Worksheet to the whole class.

Findings

Learning of content

In Tanko (2012), I provided evidence that the participants' exposure to social justice teaching afforded them opportunities to develop relational understanding of the concepts of (1) percentages, (2) graphs, and (3) time calculations. In addition, the findings also suggest that participants developed and demonstrated significant reasoning skills by interpreting their mathematical calculations beyond mathematics. For example, Shaikha said traveling by public transport would be cheaper for her but that she still preferred the college bus because she would be with her friends and it was safer. Her interpretation reminds us of one of the limitations of mathematics: that mathematics alone does not always provide the right solutions to authentic problems – which is why interpretation based on the individual's needs is so important. During the research, I taught mathematics to three different foundation classes (classes A, B and C) but only Class A were exposed to a social justice teaching approach. An interesting observation from the research was that on all tests, Class A demonstrated the

lowest standard deviation, i.e. the gaps in knowledge between the top and bottom students are less pronounced in this class. In other words, as a consequence of their projects rather than the traditional teaching approach, the participants not only learned the mathematical concepts, but actually surpassed what was expected in terms of their knowledge of mathematics. Similarly, in Tanko and Atweh (1202c), we provided evidence that the students have developed significant understanding of the concept of meaningful rounding that proved to be particular challenging for them in the past.

Challenges associated with social justice teaching in this context

The challenges encountered in this approach to the course were: (1) examination anxiety, (2) time constraints, (3) Socially restrictive topics, (4) gender issues, (5) language issues, (6) doing projects and covering the curriculum, and (7) students' reluctance to critique each other.

Examination anxiety ('exam fever')

Anxiety was apparent amongst the participants in this course. They expressed it both in writing and verbally at different times during the course. For example, in the presentation by the Time of Travel group, students expressed concerns about the fact that the exam would be made up of numbers that are not theirs:

We think about the exam. Exam is [not] like project, is all questions with some new number to calculate, not our own number[s]. This is not fun.

Similar anxiety was expressed by the Car Parking group in the final report that they submitted to me, stating: "We hope exam will not be too difficult to pass". Another student, Dalal wrote on her reflective questionnaire:

We need to study to pass exam and this project take long. I am worry about the exam because is not like the project. I like the project but my parent want me to pass exam, this is why I worry about this project and I want us to work from the book like other sections.

As stated earlier, this kind of exam anxiety was also expressed by Gutstein's (2006) students.

I recorded in my journal the number of times (at least 15 times) that students asked me whether the project they were working on would be in the exam. What was even more interesting was that the questions were always asked by the students I considered to be academically able. Although these students were enjoying the projects, it seems that they always had one eye on the exam. However, I would not consider this a disappointing response. Sadly, these students were simply responding unconsciously to the kind of pressure society has placed on them, which is the pressure to study to pass exams. The 'exam fever' expressed by the students was also expressed earlier by a parent who called me after receiving consent forms relating to her daughter taking part in focus group interviews. This parent was concerned that her daughter might not be taught "enough" content to enable her to do well in the end of year exam. Despite my attempt to convince this parent of the benefits her daughter stood to gain if she took part in these focus group interviews, she insisted on her daughter taking part in whole class activities but not interviews. It is pertinent to mention here that the focus group interviews were not mainly for my data collection, they were also designed to provide opportunity for "substantive conversations" which may lead to deeper understanding of the mathematical concepts addressed in the students' project.

Time constraints

Time to develop familiarity and trust with the students was a major challenge to teaching mathematics for social justice in this context. For instance, at the time of this research, it was the policy in the DF

Department that no teacher should teach a particular class for two consecutive semesters; this policy was intended to ensure that DF students were exposed to different pedagogical approaches. This meant that I had only a few months to win the trust of the participants in this research. If I had taught this class for the whole academic year it would have allowed me more time to become 'one with them', which would, I believe, have facilitated more open discussion in the class. My claim is supported by Fatima's remarks on her reflective questionnaire: "He teach us only this semester,..., if he teach me again next time I know him to relax and talk". Here Fatima is pointing to the fact that she did not feel comfortable talking to me because in her opinion one semester is not enough to establish trust between us. Gutstein's (2006) research on teaching for social justice involved sufficient time to get to know his students and to build the trust necessary for social justice teaching to flourish; in some cases he taught the same group for two academic years.

Socially restricted topics

Another major challenge was that the classroom in which this research was carried out did not meet all of Gutstein's (2006) criteria for a classroom for social justice because discussions on socially restricted topics were not encouraged in this context. For instance, during brainstorming sessions on suitable topics, a group of students wanted to use mathematics as a tool to investigate the rate of marriage failures. This topic would have given them the opportunity to interview fellow students from broken families with a view to providing insights into some of the root causes of marriage failures in the UAE. Although I was attempting to teach for social justice, I could not allow this topic to be discussed in my class because it may have led to controversial findings, especially if they came from a male teacher from a different culture. Issues relating to Islam, like marriage, are left exclusively for the parents and religious leaders to deal with.

Gender issues

Being a male teacher teaching female students was also a major challenge in this context. As stated earlier, all government owned primary and secondary schools are single gender, with only male teachers teaching at the male schools and only female teachers teaching at the female. Therefore, for some of the young women this was the first time a man who was not a member of their family was standing before them and talking to them. In addition, as an Emirati colleague told me, traditionally Arab women, (particularly Emiratis) are expected to demonstrate some level of shyness when a man is talking to them. Eye contact is not encouraged, as it is sometimes perceived as a sign of arrogance or as disrespectful to the other person. It will be apparent that these requirements placed unusual restrictions upon the pursuit of the programme of teaching for social justice. Were I a female teacher, this barrier would not have existed and participants might have expressed some different views. Gutstein did not have to deal with this unique barrier to his teaching for social justice: he had the privilege of having regular contacts with many of his students' parents and his students were able to maintain regular contact with him, including telephone calls even at night time.

Language barrier

Using English as the language of instruction presented an additional challenge in teaching for social justice in this context. As is the case with most UAE nationals, all the participants in this research have Arabic as their mother tongue, and Arabic was the language of instruction throughout their primary and secondary education. Some of the participants in the research found it challenging to express themselves in English, and I do not speak Arabic. Since all the class discussions and interviews were conducted in English, I was unable to capture the complete views of the participants on some issues. Although I asked the participants to complete their reflective questionnaire (Appendix 1) in Arabic if

they preferred to do so, I believe that had the class discussions and interviews been conducted in Arabic, they would have been better able to express themselves. Although Gutstein had to deal with similar language challenges amongst his students, my students were unique in that they were encountering English as a language of instruction for the first time in their lives.

Doing projects and covering the curriculum

A further challenge was my inability to provide similar learning experiences in mathematics to all the groups in class A. The conflict between traditional teaching, where all students cover the same topics, and having different groups working on their own projects was a source of tension in this study. All the projects were conducted simultaneously; therefore it was challenging to pass on information or to scaffold the participants as a whole class. If I had had all the groups working on the same project at the same time, it would have been easier to have whole class discussions amongst all members of each of the groups. Gutstein's students only carried out one project at any one time. In addition, it was also challenging for me to focus attention entirely on the project because of the pressure to cover the prescribed curriculum in time for the end of year examination.

Students' reluctance to critique

Finally, another major challenge was students' reluctance to critique each other. During the earlier stages of this research, my students were reluctant to ask their classmates questions during class discussions; and whenever one of them said something, the others were always reluctant to express opposite views. I had a 'quiet' discussion with one of the participants (Muneera) and she said if I asked the first questions, it would be easier for the students to contribute because then their classmates would not be offended that they started the questioning. From that day on, throughout the presentations, I asked the "ice breaker" question after which meaningful discussions usually followed. This contrasts with Gutstein's (2006) account, which does not report any reluctance by his students to express views opposite to those of their classmates.

Implications

One of the important implications of this study is related to the practice of teaching mathematics in this context. The findings from this study draw attention to an urgent need for a meaningful mathematics curriculum in the Middle East – one with real life connections to the learner's world. This is important because sometimes students disengage from mathematics study because they find it boring, meaningless and without relevance to their lives (Peterson, 2005; Tanko & Atweh, 2012). A curriculum with real life connections could support students' understanding of mathematics because it would allow them to draw upon familiar experiences in making sense of the mathematics. However, it takes time to write good curriculum (Radical Math, 2007). In addition, the teachers who would deliver the curriculum need to be trained on how to relate mathematics topics to the real life experiences of their students. This call is in line with Jacobsen and Mistele's (2010) findings that the abilities of some preservice teachers to connect mathematics and social issues improved dramatically as a result of the training they received.

Some limitations of the research

One major limitation of this study is that because I come from a different cultural background to the students' it may not be possible to fully understand many of the challenges these students might have

encountered throughout their journey with me in this research. One can only hope that those challenges are not significant enough to affect the conclusions reached in this research.

In addition to the above limitation, there is a lack of research with regard to teaching mathematics for social justice in the United Arab Emirates and the Middle East in general that could be used as a base line for reference. Consequently, this research had to refer to literature from different cultural contexts.

A final comment

As stated earlier, the interpretation of social justice is always contextual. With that in mind, one of the important lessons from this research is that teaching for social justice is doable in the Middle East. However, in the currently politically charged atmosphere throughout the Middle East it needs courage and commitment on the part of the teacher and even protection by the head of the college or policymakers because it is risky. In addition, this research has illuminated some of the unique challenges associated with teaching for social justice in the Middle East, in particular the UAE. Therefore, it is reasonable to assert that, limited in scope though this study has been, it has nonetheless supported the assertions of those who had hitherto engaged in the same field and it has also added to the limited literature available on the teaching of mathematics for social justice, especially in the Middle East.

If the findings of this research are to be of maximum utility in the promotion of this pedagogy, then it is important to go beyond consideration of the performance of students exposed to this research (as discussed in Tanko & Atweh, 2012b, 2012c) to consideration of how this pedagogy would move from being merely another piece of academic research to being an accepted pedagogy rolled out into classrooms as a widely applicable educational modality. My understanding of the implications of this research coupled with a literature review of contemporary research by others (none of which was found to discredit the pedagogy), reinforces my belief that this pedagogy should be promoted as a valuable tool for improving educational outcomes for the students as well as making those students more valuable contributors to their society.

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Appendix 1

Reflective Questionnaire

Please answer the following questions. You may write in Arabic if that would make it easier for you to express your point of view.

1. Do you like working on project work? Explain your answer fully.
2. Are the project(s) you have just completed the same or similar in form with the ones you have done in the past? Explain your answer.
3. What do you like or not like about the mathematics projects you have completed this semester?
4. What would you have done differently if given the chance to repeat these projects?

Appendix 2

Time of Travel - Mathematically Enriched Worksheet:

1. At what age are people allowed to drive in the UAE? Search for information on the internet (using www.google.com.au) about the ages people are allowed to start driving in countries like Australia, United Kingdom and America. Explain any differences and similarities in detail.
2. Find out how many students in your class come from [outside the city].

Write down your answer here. _____

3. For the academic year (2008-2009), there are approximately 2300 students registered at the college. Based on your answer to question (2), calculate the percentage of students you would expect to come from [outside the city].
4. Copy your travelling times to and from college on the table below.

Remember your travelling time to college starts when you enter the bus or car from your bus stop or home, and ends when you come out of the bus or car in the college compound. Similarly, travelling time from college starts when you enter the bus or car from the college, and ends when you come out of the bus or car at your bus stop or home.

	TO COLLEGE			FROM COLLEGE		
	Time I entered the bus or car from my bus stop or home	Time I came out of the bus or car, in College compound	Total time on bus or car	Time I entered the bus or car from College compound	Time I came out of the bus or car, at my bus stop or home	Total time on bus or car
Sunday						
Monday						
Tuesday						
Wednesday						
Thursday						

5. From your table in question (4), calculate the percentage change between the total number of hours travelled on Sunday and Thursday. Say whether is an increase or decrease.
6. From your table in question (4), calculate the approximate total number of minutes you spent on the bus in a week.
7. Express the total number of hours spent on the bus on Monday as a percentage of the total number of hours spent for the whole week.

8. A journey on a bus from city G to city H will normally last for two hours, and every passenger pays Dh15, for this journey. Use this information to calculate how much it would have cost you to travel to college using public buses.
9. From your answer in question (9), do you think those of you who travel by bus to college are getting a good value for money? Explain your answer fully.
10. What do you like or not like about the bus service provided by college? Explain your answer.
11. What improvement/change would you like to see made to the current transport arrangements at the college? Explain your answer.
12. What do you like or not like about this method of teaching mathematics? Explain your answer.