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Introduction


Michael is a year seven student at a relatively large state high school located in the Brisbane metropolitan area. I have worked with him for four and a half out of six weeks of my practicum placement and taught approximately half of his last unit of study for Design Technologies for this year. The main focus of the unit was to learn the 3D modelling program called Inventor. The aim was to create and 3D print a simple key tag at first; a task through which students learned the basics of the program. Once complete, the students continued on to design a mobile phone holder. The design was to be fully developed by the students with the purpose to learn more complex aspects of Inventor. The final summative task was the Task Sheets booklet which was to be filled out by each individual student. Considering the fact that he never used Inventor before, Michael did exceptionally well with both his designs. However, the booklet was a challenge for him and he did not do well in this area.

Michael's NAPLAN and other school  assessment results indicate that he is performing on a low level in the areas of literacy and numeracy (Appendix A-Student Results). Some improvement is evident in Michael's academic results charts over the last two years however, in the areas of reading and writing he has regressed. Through the discussions with my mentor (Appendix B-Mentor Professional Discussions) and observations of his Inventor work in my classes (Appendix C-Student Inventor work), I have identified Michael to be very capable and performing in the area of high achievement (HA) when it comes to his practical tasks. However, based on the collected data and observations (Appendix D-Observations) there are learning issues that are preventing him from excelling in his school work.

Analysis of the issues

Throughout the second and third week of my practicum placement, I had a chance to work with Michael individually during each lesson. During this time I identified some key learning issues:

- difficulty with understanding the KLA vocabulary
- some difficulties with comprehension (mostly evident through the booklet work, Appendix E-Task Sheet Booklet)
- difficulty understanding the spatial concepts in numeracy like size and measurement, proportion and the relationship between 3D objects
- difficulty sustaining attention
- almost never completes written tasks or provides insufficient information

Additionally, Michael's Maths and Science and English teachers (Appendix F-Professional  Discussions-Other) have expressed concern for his wellbeing at school. They confirmed that Michael never does his homework or written tasks and always has poor excuses for not doing it. He often resorts to lying, lies to his friends by making up people, holidays, travels etc. As a result, he has no friends at school as almost all have distanced themselves from him. Michael's Maths and Science teacher had interviews with his parents, just his mum and other teachers at school in an attempt to help. There has been some minor improvement however not for long. The teachers involved are keeping an eye on him for now and are working with his mum as much as possible to help. He advised that, if the behaviour and particularly the compulsive lying does not change, they will discuss the matter with the deputy and probably the school counsellor in order to create some type of an intervention plan. The issue of compulsive lying needs to be properly diagnosed and treated and this is not something a teacher should attempt to deal with. Although it is important to note these

problems as they do affect the student's academic performance, the purpose of this report is to analyse the student's learning issues and my differentiation for him so the report focus will be on that.

Having identified the issues, I worked with my mentor on developing some strategies that would help Michael achieve his learning outcomes. These outcomes are: complete the Task Sheet booklet, successfully create and 3D print the Inventor models, to see himself as worthy and confident and know he can be good at something and have a positive experience with the subject.

Justification of teaching strategies supported by academic literature and collected data

In order to understand and respond to the student and his learning needs as best as I can and for the purposes of consistency in instruction, I familiarised myself with the school rules and routines, I spoke with him on a number of occasions, asked him to fill out the "Who Are You?" interest inventory, the "Learning Profile Questionnaire" (Tomlinson, 2001) and the "KWL" sheet (Appendix G-Sheets and Log). I also observed his work on Inventor and took anecdotal notes and photos as well as worked with him individually on the Task Sheet booklet. Based on the data I collected I determined that Michael is a visual learner (Vakos, 2016). Additionally, I have decided it would be the best to first focus on the literacy and the KLA vocabulary to help him understand the meaning of words and phrases and task requirements. Knowing that Michael does not respond well to written tasks and because of not knowing where he could find the information, I agreed with the mentor to provide the list of new words and their meanings, list of approved resources and to be Michael's scribe. After I handed out the first list of new words, I realised that this is not the best way to approach literacy learning as the student did not engage with the activity and I did the work for him. I further consulted with the mentor and he advised that the school encourages teachers across all KLAs to ask students to write the new words in their English books. From then on we analysed each new word in class as a group and the students wrote them in their books. However, Michael has not written them saying he will remember.

As his written task was not yet completed, I participated in further discussions and research and found that the school uses Marzano's pedagogical framework (Concordia University, 2016 & Killian, 2015). Researching this framework further, I decided to chunk the booklet work by setting smaller and more manageable homework and class work tasks. I set aside class time for students to work on the booklet in pairs and as a whole class group; we answered more complex questions together and worked on simpler tasks for homework. After further research, I decided that the tasks need to be more explicit than I had initially explained (Edwards-Groves, 2003). In addition, during the second break of week five Michael and I worked on the booklet together and he completed three questions he needed my help with. Although he said he will be fine to continue on his own, he did not do any further work on this. As neither approach resulted in major changes in Michael's work on the booklet, I asked him to spend some time each lesson working on it first and then other activities and I would monitor. He started doing this during the last week of my PEP however I could not record any outcomes as my practicum placement ended. The booklet is completely text based and is quite unengaging which is a struggle for a visual learner (Vakos, 2016). Unfortunately, I was not allowed to change the layout or the appearance of the document.

To help Michael with the numeracy, I observed his work on Inventor with the key tag project and determined he struggled with size and proportion. After consulting some academic literature (Munro, 2016), I realised Michael's problem is in the area of spatial numeracy. In response, we did measurement conversion activities, namely millimetres to centimetres and we physically measured objects and typed sizes into Inventor. I projected my Inventor instructions and exercises onto the

screen for the whole class to watch. The students noted the automatic 3D space and object size changes which made a big difference in their understanding, particularly for the visual learners. Another area of struggle for Michael was proportion. As Michael is a visual learner, I modelled this instruction on screen a few times and worked with him individually. As he still could not understand it fully, I agreed with the mentor to record an instructional video on creating a key tag and uploaded it to the student drive. Shortly after, I participated in the Flipped Learning PD (Appendix H-PD Record) and found that I have not recorded the video well for this particular age group. During the PD it was pointed out that instructional videos for middle year's students should not be longer than three to four minutes and should contain only up to three instructions. I then re-recorded the instructions, and uploaded to the student drive. Michael watched the instructions for his homework and was able to complete the tasks successfully (Appendix C-Student Inventor work).

To improve the time for completing tasks, in addition to chunking the booklet, my mentor and I agreed to allow him some extra time. Now, his booklet assessment is due at the same time as the practical component. Working with the school rules and routines, I have asked the students to bring their study planners to class and record homework but Michael regularly came to school without it. I sourced a weekly planner; I handed it out in class and explained its use (Appendix G). The point of the planner was to chunk the responsibilities in order to manage them better. This was ineffective as Michael did not use it and gave it to another student.

As my approaches with helping Michael learn did not always succeed, I decided to use KWLH sheet (Fragenheim, 2007) as one of the questions on it asks "How will I learn it". Knowing he does not engage well in writing, I stated on the sheet that simple keywords will suffice. However, he responded by writing "Yes, maybe". As this was not helpful, I consulted with my mentor and discussed that, from my observations, he learns and remembers instruction best when shown individually. His Maths teacher also confirmed that Michael responds well to individual instruction. For this reason and as Design Tech is a problem-based-learning (PBL) centred subject, I researched PBL differentiation methods (Miller, 2016). From this point on, after setting lesson goals and a task for the whole class, I differentiated by: working individually with Michael as needed, included student choice in project, student set pace, vocabulary at readiness levels and peer support (Appendix D-entry Wed 02.11.16 PBL Differentiation). His work on Inventor went from strength to strength, he learned new functions and effectively evaluated and adjusted his design.

Conclusion

The student did very well with the drawings and the design of his mobile phone holder and is quite artistic (Appendix C-Student Inventor work). His work on Inventor was quite impressive particularly because he had never used it before. He learned quickly and was able to effectively evaluate and adjust his work despite the issues with spatial numeracy. He overcame some numeracy issues by trial and error which indicates autonomous approach to work and intrinsic motivation to at least some aspects of the task. The most effective approach with Michael was individual one-on-one instruction. He learned a lot quicker by being shown directly. For more complex instruction I used 'I do, we do, you do' model and this worked well for Michael. His 3D modelling work is at around HA level based on the evidence of understanding thus far, however the project is yet to be completed. In terms of focusing in class and working on his booklet assessment, not much was achieved. Not all strategies I tried produced significant result. Allowing additional time may help however the booklet is very long, unengaging and requires significant amount of time and effort especially for this year level. Modifying the booklet or separating it into sections and completing each one individually would work better. To successfully continue in this subject area and schooling generally, Michael will need to use his study planner and learn to manage his time more effectively, learn that he needs to

do tasks he does not like too and use his class time better (minimise homework time). The written tasks will have to be modified and chunked for him and each completion to be rewarded, as an encouragement.

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