Title

A creative approach for undergraduate nursing students to learn anatomy and physiology: A qualitative exploratory study

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Abstract

Anatomy and Physiology (A&P) courses in undergraduate nursing programs are often considered challenging for students. Typically, a wide variety of teaching strategies, including dissection, experiments, illustrations and photographs are used to engage students. This study aimed to explore and describe the learning experiences of an open creative assessment task on undergraduate nursing students of learning A&P. A total of eight students participated in semi-structured interviews. Two major themes emerged from the data, this included 'Bringing A&P to life' which included two sub-themes of 'Learning through peer teaching' and 'An easy way to learn', with the second major theme, 'Custom made learning' which included four sub-themes, 'To grade or not to grade', 'Catering for different learning styles', 'Logistics of group work', and 'Effect of group dynamics'. This qualitative exploratory study contributes to further pedagogical insights into art and/or creative approaches to teaching.

Key Words

Nursing, Curriculum, Anatomy and Physiology, Creative, Assessment

1. Introduction

The science of anatomy and physiology (A&P) is an essential component to any Bachelor of Nursing curriculum. However, the teaching of A&P to nursing students does not come without its challenges. Given the heavy 'memorisation' aspects of A&P courses, it was decided to shift the assessment of students' knowledge from a traditional summative to a formative assessment task with the addition of full creative licence. Two first year, fundamental A&P courses delivered to Bachelor of Nursing students incorporated the new creative hurdle (pass/fail only) task. Traditionally in these courses, students were solely examined on their recall ability of knowledge and concepts in their study of A+P. In addition to these traditional assessments the creative hurdle task was implemented. The students were afforded total freedom of creativity with any format of presentation, along with the freedom to select any concept from the coursework as the basis of the task. The only criteria for the task stipulated to the students were on the ability to introduce the concept to their peers, the accuracy of the science presented, the structure and sequence, and finally attractiveness and creativity of the presented item. Students self-selected groups of up to 5 members in the first week of the semester and were expected to present their final tasks in class during the eighth week of the semester. During this dissemination process students had to explain their project to their peers, discuss the various components and how they came about forming the project and relay the concept they explored, opportunity for discussion was also offered following presentation time.

The purpose of the study was to contribute to the evolving landscape of assessment approaches to A&P courses in Australian universities, particularly within nursing programs. The study aims to discuss the approach to A&P education within nursing programs that have the potential to offer more formative approaches rather than the traditional summative

approaches to assessment. It is envisaged that the findings of the study may provide a valuable alternative for educators seeking to make similar adjustments in the assessment of their own A&P courses. While this paper presents a specific emphasis on the development of an open creative task for nursing students with an A&P course, it seeks to provide similar considerations that are equally transferable to other disciplines requiring fundamental knowledge of A&P.

2. Theoretical Framework

The underpinnings of the study are structured around Bloom's taxonomy, which classifies statements of what teachers expect or intend their students to learn, within the prescribed education (Bloom et al., 1956). The original taxonomy provided for six cognitive domains, however was subsequently revised and updated to include the following levels; remember (lowest order), understand, apply, analyse, evaluate, and create (highest order) (Krathwohl, 2002).

In addition, the arts based pedagogy specifically attempts to allow students to construct and demonstrate knowledge through artistic means. This philosophy by John Dewey suggests that content should not be taught in silos and more importantly, that integration of the arts allows for a combination of individual growth, social, and active learning experiences (Dewey, 1934). This is further supported by Marshall (2006) who states that learning is constructed through engagement with the world and it includes experiential and socially active learning experiences to build knowledge.

Hence, this study focused on the importance of progressing the levels of the Bloom's taxonomy from lower order (remember), towards the higher order (create), to more

effectively instil fundamental knowledge of A&P. In addition, it permits the construction of knowledge through an arts-based pedagogy which enables an active, experiential and socially active learning experience.

3. Background

A&P is often the first of the more challenging courses nursing students face in their degree and a variety of teaching and learning strategies, including dissection, experiments, illustrations and photographs are all used. The use of illustration in medical teachings is not new. For example, the works of the artists, Hager Padget and Audrey Arnott working for the neurosurgeons Walter Dandy and Hugh Cairns are of historical significance, and takes example from the works of Da Vinci (Johnson & Sainsbury, 2012; Shoja et al., 2013). The combination of the arts into the curricula of A&P can enrich learning for students, particularly for those that tend to believe A&P to be a boring learning experience (Izadi, 2017).

The use of creative and artistic approaches to teaching is often quite subjective, yet it has the power to encourage self-expression, thinking, imagination and the ability to allow expression of deeper meanings and feelings about one's self, particularly as a nurse (Frazier & Caemmerer, 2014; Munakata & Vaidya, 2015; Rieger et al., 2016; Walji-Jivraj & Schwind, 2017). Price (1995) explored the concept of allowing advanced A&P students to conduct artistic group projects, where students expressed a better retention of information and higher levels of motivation and interest. This is similar to medical students invited to partake in life drawing classes with the aid of an anatomist, with students reporting their increased interest in the study of anatomy (Phillips, 2000). Furthermore, the art and creative pieces produced by

students in this process can often serve to further educate students, exposing the entire cohort of students to the creative expressions (Courneya, 2018).

One of the key themes from the literature surrounding the use of artistic and creative tasks to enhance student learning in A&P is the higher levels of engagement observed. The use of such projects in A&P encourages higher order thinking within the scope of a positive and more enjoyable learning environment, and empowers conceptual understanding (Jensen et al., 2003; Nash et al., 2018; Polizzotto & Ortiz, 2008). Such motivation has also been improved by gamification of learning, where students are permitted creative freedom to produce comic strips in a biology course (Pitura & Chmielarz, 2017). Clearly this body of evidence supports the notion that the use of artistic and creative freedom for students within the scope of A&P curricula, has the potential to improve and enhance learning experiences.

In addition to the improvements to the learning experience, the fostering of creativity in nursing curricula has the ability to encourage and develop inquiry and creative ways of solving complex issues (Casey, 2009; Duhamel, 2016). As such, artistic and creative tasks support a learner-centred experience that enables the development of creative problem solving (Brown et al., 2009). However, such artistic and creative pedagogies are not without their own pitfalls. The literature states such assessments and teaching strategies often require additional time dedication with many academics and students alike often placing less value on such forms of teaching and learning possibly due to a lack of understanding of the pedagogy (Gerrish et al., 2000; Marquis & Henderson, 2015). A lack of convincing marking rubrics for such assessments or strategies to ensure completion of such tasks is also evident in the literature (Reyna & Meier, 2018).

Given these findings within the literature, the purpose of this research was to further explore this field within the context of A&P courses within a nursing curricula. In this research study we explore the student experiences of an open creative range in A&P. Working collegially, students were provided full creative and artistic freedom, the only scope being that topics for their projects must be found within the course content.

4. Methods

4.1 Aims

The aim of the research was to explore and describe the experiences of an open creative assessment task on undergraduate nursing students' learning of an A&P course.

4.2 Research design

This research utilised a qualitative exploratory study design as the purpose was to explore what the experiences and perceptions of the undergraduate nursing students' were of the open creative assessment task in their undergraduate learning of A&P. Such exploratory studies allow an attempt an answering the 'what' and enable a definition of subsequent research to be defined or determined (Hancock & Algozzine, 2011).

4.3 Ethics

Ethical approval was granted by the **XXXXXXXXXX** University Human ethics committee prior to data collection (Project number B17-022). All participants in this study gave informed consent prior to data collection with their confidentiality maintained.

4.4 Participants

149 The participants constituted undergraduate students (n = 8) currently enrolled in a Bachelor
150 of Nursing program across a large regional and multi-campus university in Victoria,
151 Australia. All students had completed at least one A&P course, where the open creative task
152 was implemented. A total of 11 students had registered for the interviews, however 3 did not
153 attend their allotted interview times. Of the students that participated in the interviews, the
154 majority were female (n=7) with one male (n=1) participant.
155
156 *4.5 Procedure*
157 Student participants were recruited via a research project flyer via the generic nursing degree
158 online teaching and learning platform. Participants then contacted the researchers to arrange a
159 time and date for participation in a semi-structured interview. Participants were provided with
160 the project plain language statement and were instructed to sign the consent form prior to the
161 commencement of the interview. A series of semi-structured interview questions were used to
162 ascertain the extent to which the participants felt that the open creative assessment task
163 impacted on their learning (Table 1). The interviews were conducted by author JEP who
164 holds a PhD in Nursing and extensive research training experience. The interviewer did not
165 have any direct relationship with participants, nor was involved in any of the teaching and
166 learning activities associated with the participants. A relationship of trust was established
167 prior to the interviews. Participants were informed that all data would be aggregated and that
168 the interview transcripts would not be seen by senior management. The study aims were
169 explained to the participants and that an open and honest representation of the experiences of
170 the creative task would be presented in the findings. The interviews were conducted in a
171 private conference room and were audio recorded, lasting for an average of 30-45 minutes,
172 were conducted in August – September of 2019. No other non-participants were present
173 during the interviews. Repeat interviews were not performed, however interviewees were

permitted time at the conclusion to express any additional comments on their experiences of the creative task. It is worth noting that this study was conducted prior to the COVID-19 global pandemic and that delivery of this course was in a blended environment, which included both online lecture material and face-to-face laboratory classes.

4.6 Analysis

The verbatim transcriptions of the audio recordings were analysed using Creswell's (2003) six step approach to conducting a thematic analysis. The data analysis involved; organising and preparing the data (transcribing the interviews), gaining a general sense, coding (into meaningful chunks), describing (putting the coding into context), representation of data (convey analysis findings) and interpretation or meaning of the data (Creswell, 2003). All authors were involved in the analysis of the data.

To ensure familiarisation of the data, field notes were recorded during the interviews highlighting concepts and all researchers independently read through all transcriptions before the coding process. Open, axial and selective coding were employed consistent with grounded theory ensuring that ideas and concepts of the student experiences were linked (Creswell, 2007). All lines of transcripts were numbered to aid identification of quotes and commonalities. This open coding allowed information to be broken down, to gain a better understanding of the information (Liamputtong, 2009). Finally selective coding facilitated the identification of core categories which were designated to themes. The consolidated criteria for reporting qualitative research checklist for interviews and focus groups (COREQ), was implemented to ensure accurate and complete reporting (Tong et al, 2007).

5. Results

A total of eight student participants volunteered to be part of the semi-structured interviews across the regional multi-campus university, all of whom had completed at least one of the A&P courses where the creative open task had been implemented. All participants were currently enrolled within the Bachelor of Nursing program. Examples of the creative tasks produced by students are depicted in Figure 1 and included vast arrays of submissions from 5 minute skits/plays in class, models, posters, cartoons/comics, vignettes, cakes, songs/rhymes, and the development of board games. Examples were reported by all participants in the interview transcripts. All participants reported on their creative open tasks with fondness and expressed how fun the task was. One participant stated; "*I did white blood cells, so we baked five white blood cell cakes and they were all labelled and everything, which was kind of fun*". Participants further reported how 'amazing' the final creative open tasks produced were, "*we had one person create a cake that was the heart. They had it all labelled, and it looked so real. It was large, but it was amazing*".

The two (2) major themes and six (6) sub themes that emerged from the data included; 'Bringing A&P to Life' incorporating the sub-themes, learning through peer teaching and an easy way to learn, and the second major theme, 'Custom made Learning' incorporating the sub-themes, to grade or not to grade, catering for different learning styles, logistics of group work, and effects of group dynamics (Table 2).

5.1 'Bringing A&P to Life'

5.1.1 Learning through peer teaching

Participants explained how learning from their peers had a positive impact on their ability to recall and understand the particular topic. They felt they understood the topic better when the

topic was presented with humour, or in a more simplified way; *"They're [the students] explaining it in layman's terms…you kind of just watch it and go oh that's what that means. I couldn't get my head around it in the book but now it makes sense".* Other participants found learning from their peers made recalling the information easier, especially when studying and completing exams; *"I do remember the other peoples creative group presentations and going into the exam when I was revising. I was like, oh they did that, I remember that, because I enjoyed it and because I'm also a visual learner it just stuck better".*

When participants were preparing to teach their peers, they found having to learn the content themselves in order to teach it, actually assisted in retaining the knowledge themselves. One participant explained *"if we talk through what we're learning with peers and everything, that sticks in my mind rather than studying by myself".* When asked about the different methods used to teach peers, such as posters and models, participants felt the posters to be less engaging, not only to teach a topic but to learn from. They identified models being the preferred method, and explained *"the model definitely got the message across because it was something that people could look at, see, touch, play with and I think they were more interactive".*

5.1.2 An easy way to learn

A&P was brought to life for participants by being part of the process of creating a different way to learn a complex topic. Participants felt they learnt more from being involved in the process and encouraged them to investigate the topic more than they would have. One participant recalled their experience of being able to recall what they had learnt; *"The minute I see a cell, I'm like, that's the mitochondria, this is the plasma, little quirky facts that seems so daunting to begin with…I remember it because of those hurdle tasks that were so relaxed*

and so fun and so interesting". Participants also found the activity an easy way to learn themselves to be able to educate their patients when the opportunity arises in the future; *"you've also got to understand the basic logic as well, to explain it to your patient who doesn't have the knowledge. So in that way, it's really good".*

5.2 'Custom made Learning'

5.2.1 To grade or not to grade

Participants highlighted the amount of effort and time that went into completing the task, and producing their chosen piece of art. They acknowledged they had fun completing the task but wanted a more tangible remuneration, especially when participants covered the financial cost of the activity for what they saw as an unequal return. One participant said; "*...a score on it would be good….you do put a lot of time and effort into it, so I think you should be rewarded with some score".* However, some participants felt a non-graded approach reduced the stress associated with an assessment. They felt the process was more relaxed and they could be more creative and have fun, while learning themselves, and working collaboratively, but also teaching their peers; *"...you are working with other people so it's taking their creative ideas and working collaboratively with them and knowing that you're not getting fully graded on it, means you are going to have so much more fun with it".*

5.2.2 Catering for different learning styles

Different learning styles is an important consideration in any teaching and learning activity, and participants recognised this when planning and delivering their own activity. Some of the participants identified they were visual and audio learners but needed to "*do [the activity] over and over again to go, oh now I get it".* Participants felt the activity assisted students who have difficulty learning through reading and writing styles and provided an opportunity

"*where they learn more visual and more hands on. [The activity] gives everyone a chance to learn equally".* One participant recalled the impact of completing the activity previously; *"I've still got visualisation of my first semester project, which is good. I can still relate where everything is and it was so bright and colourful and I learn from visual, so to me, was a great thing. Visual learners will try their best to do a creative project. I think it's not just going to be beneficial for some students. I think it will be for all".*

When choosing the topic for the activity, participants identified opportunities for inclusive participation regardless of learning styles. They felt students who prefer not to learn visually, they are "*still in the group and they can still participate in some ways".* Participants also viewed the activity and aligning with a learning style not familiar to them, provided opportunity to challenge themselves by choosing a topic out of their comfort zone or one they needed to focus on; *"I think visually, its great and it does make you think and we get an open choice of what we can do, so I think it's to your own benefit that you choose something that you're really not sure on".*

5.2.3 Logistics of group work

There were challenges with participants being required to work in groups to complete the activity. The main challenges were fitting in with individual lives, commitments outside of university, physical distances where each person resided and not being able to contact group members. One participant mentioned *"we were trying to do what we could find that would fit in with our time schedules, and where we were, and where we all live as well".* Although the participants identified the logistics of the open task as causing some group issues there were many benefits that correlated with desirable nursing attributes. Conflict resolution, working

cohesively as a team and being able to deliver a meaning education session are important skills for nurses in the clinical setting.

5.2.4 Effects of group dynamics

Along with the challenges with the logistics of group work mentioned above, the group dynamics also created challenges. The main challenge appeared to centre on unequal contributions to the work required by various group members, one participant said they and another group member *"tried to organise everything, and then other people just can't be bothered".* With another acknowledging the challenges that often come with group work, with some *"[putting] in a bit more effort than others and I think that's just – I'm learning with groups, that's just what seems to happen".*

Although there were challenges, participants identified opportunities associated with group work they might not have had if the activity was an individual assessment. These opportunities were the ability to create networks with people they "*wouldn't have associated with the group of people that I'm with".* Some found the timing of the group selection challenging this did however provide students with an opportunity to work with people they had not yet interacted with, a participant stated, "*you had to decide in the first class who you were with, and I knew nobody. So, luckily a girl next to me said, do you want to be with us and so it kind of worked out like that".* Although the activity did take significant commitment and time, participants viewed the experience positively, especially becoming familiar with their peers with one participant stating, *"I got to know some new people, so I looked at it that way, as a bonus".* Another participant expanded further about the dynamics of group work and how it can enhance interpersonal skills; *"It also teaches you how to deal with other*

personalities……..it made me think about how – what other people are thinking and what they're doing……..it does push you out of your comfort zone".

6. Discussion

With evidence to suggest that the integration of art into the curriculum not only improves engagement and motivation but also students' academic outcomes and content retention and recall (Hardiman et al., 2019), the current research explored the impact of an open creative assessment task on undergraduate nursing students' learning of A&P. In particular, the current study investigated the student experiences of an open creative task. Including arts-based projects is not a new concept, particularly in courses such as A&P where some students may find the content 'boring' or in other cases overwhelming (Izadi, 2017).

The results of the current study produced two major themes; 'Bringing A&P to life' and 'Custom made learning'. All participants in the current study expressed a generally positive experience overall and engaged with the task at hand, with participant feedback indicating that the task was 'fun' and 'amazing' to be a part of. These findings are in agreement with those of Courneya (2018), who demonstrated that utilisation of an art-making project in a medical student cohort aided in their retention and enjoyment of the subject matter. The main sub-theme highlighted by student feedback was the importance of peer-to-peer teaching/learning. Students conveyed how much they learnt by seeing everyone else's work and the fact that this was visual, tactile and explained in layman's terms making the topic easier to understand and retain. This result is similar to the theme of 'Learning through peer teaching' observed in the current study. Here students reported similar effects however in the context of undergraduate studies of A&P in nursing. Further contributing to the overarching theme of 'Bringing A&P to life', Courneya (2018) reports participants also found the art-

based task an easier way to learn an otherwise difficult concept. This is similar to the data collected in the current study where students report the benefits of the task under the sub-theme of 'An easy way to learn'. By being actively involved in creating a different way to learn difficult concepts, participants investigated the topic more than they otherwise would have without this task. Interestingly, the participants in the study conducted by Courneya (2018) were able to make the link between the purpose of the task and the ability of being able to relay the knowledge to their patients or their peers.

The second major theme to evolve from the current study was that of 'Custom made learning', encompassing the sub-themes of; 'To grade or not a grade', 'Catering for different learning styles', the 'Logistics of group work', and the 'Effects of group dynamics'. Participants engaged with the task quite comprehensively and as a result many thought a grade should have been applied to the task, as in some cases the financial cost of completing the activity was not equal to what they received in return with respect to a numerical grade. On the other hand, other participants felt that their level of stress was reduced and were able to engage and enjoy the task a lot more having no grade applied. The fact that participants had open range to choose, create and present their topic allowed them to enjoy the task, engage and tailor it to their own style of learning. These concepts support the notion of understanding science through the lens of art as discussed by Izadi (2017). Izadi (2017) further explains that if students are afforded the creative opportunity, they are able to express their deeper thoughts and feelings, with potential to result in a much deeper and cemented learning experience.

The importance of group work is often stated as a means of preparing students for real-world situations and is an important skill to master (Roller & Zori, 2017; Pamplona, Al-Saadi, &

Al-Ghenaimi, 2019; Brundiers, Wiek, & Redman, 2010), and is especially true for nursing students within the current study. Under the major theme of 'Custom made learning' and the sub-themes of; the 'Logistics of group work', and the 'Effect of group dynamics', participants commented on geographical challenges as well as outside commitments posing issues, along with group dynamics. However, these challenges did not limit opportunities for participants to collaborate and cooperate on the task while developing their interpersonal skills. The study conducted by Jones, Kittendorf and Kumagai (2017) supports the use of arts based projects in medical students to enhance such collaboration skills. Furthermore, as reported by Munakata and Vaidya (2015) teamwork has the benefits of learning how peers observe problems with a different lens or angle. Together, students in the current study were able to not only explore a topic or concept in A&P on a deeper level, but learn teamwork skills such as cooperation, collaboration and team management, that can be applied outside of the classroom environment.

Creative tasks such as the one employed in the current study have previously been linked to a significant positive relationship between perceived gains in learning and student grades (Pamplona, Al-Saadi, & Al-Ghenaimi, 2019) and while not explored here, it would be interesting to examine this in future with respect to the current study. However, what is evident, is the motivational effects an arts-based open task had on the students. In the current study, the creative freedom allowed the topics of A&P to 'come to life' for the students. The application of a wider range of skill sets engages students and hence influences motivations to learn (Pitura and Chmielarz, 2017; Nash, Cox & Prain, 2018).

7. Limitations

There are some perceived limitations to this study. The participants in this study were all enrolled in the Bachelor of Nursing degree and therefore the experiences of students enrolled in other programs were not captured by the findings of this study. In addition, students that did not elect to participate in the study were not captured in the data collected here. There were some limitations to the depth of literature available around arts-based pedagogy for A&P courses within the context of nursing education experiences and within the context of the Australian university sector, however this paper will add to the breadth of knowledge on this topic.

To establish the trustworthiness and control for potential biases through the study design, the researchers sought to determine the study's credibility, dependability, confirmability and transferability (Sandelowski, 1986). To determine credibility, a review of literature was undertaken prior to data collection to establish a conceptual framework and comparison for data analysis of this study. This study also sought to improve the reliability of the data by interviewing as many participants as possible, to gain rich descriptions. To establish dependability, the findings were compared with current literature. Confirmability of this study was achieved by using ongoing reflection to ensure the data findings were not an outcome of biases and subjectivity (Bloomberg & Volpe, 2012). With respect to transferability, the data findings may be applied to other contexts of a similar nature; however, given the small sample size the findings may not be applicable to other disciplines.

8. Implications for an International Audience

- Little is known about the experiences and perspectives of nursing students and the use of a creative assessment models.

- Research into the art based pedagogies widely explores medical student experiences and perspectives but does not explore nursing students.
- Art based pedagogies have the ability to expand the imaginations of students and allow higher order thinking.
- This qualitative exploration of nursing students' experiences contributes the pedagogical insights into creative approaches to teaching and learning of A&P in a Bachelor of Nursing degree. With many participants stating that this way of approaching an A&P task made it easier to remember the content, the utilisation of such methods would suit many 'content heavy' courses. Thus, an arts-based pedagogical approach would make it an appropriate tool to aid students in their learning.

9. Conclusions

Overall, participants found this open creative and artistic approach to the A&P hurdle task to be engaging, enjoyable and allowed each learner to explore topics that they may have found otherwise difficult in the past with more traditional teaching styles. In moving forward, the teaching of A&P could engage activities that include different areas of knowledge, and thus allow the use of a wider variety of skill sets by students to enhance and influence motivations to learn. By applying freedom to express and create content, students can actively engage with the learning and hence provide a better learning outcome and experience. It is also worth noting that such applications are not limited to A&P for undergraduate nursing students, nor the biological sciences. Inclusion of arts-based pedagogy has a wide scope of application across the disciplines and teaching in nursing education, as an example could include application in reflective practice activities. Such opportunities should be explored in the

444 wider context of teaching and learning for undergraduate nursing students to deepen their
445 connection to content and enhance learning experiences.
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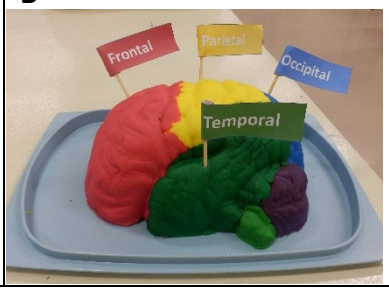
11. Figure Legends

Figure 1. Examples of students' creative tasks. A; an edible model of the abdominopelvic region, B; a plasticine model of the various lobes of the brain, and C; a foam model of a mammalian cell complete with organelles.

12. Table Legends

Table 1. Interview question schedule.

Table 2. Summary of key and sub-themes.

A	B	C
 STOMACH INTESTINES APPENDIX	 Frontal Parietal Occipital Temporal	 Golgi Apparatus Ribosome Nucleolus Lysosome vacuole Nucleus

What sort of project did you complete? What did you create?
What medium/format did your project take?
What concept did you aim to teach to your peers?
How did you work with your group to create your project? How much effort did it take?
Did you enjoy your project and using creative art as a medium to learn and then teach others your concept in anatomy and physiology? Discuss
Did this project give you a deeper understanding and appreciation of the concept? Discuss
Discuss any strengths and/or weaknesses of the task.
Is there anything else you would like to share about your experience of the task?

Major themes	Sub-themes
1. Bringing A&P to Life	1.1. Learning through peer teaching
	1.2. An easy way to learn
2. Custom made Learning	2.1. To grade or not to grade
	2.2. Catering for different learning styles
	2.3. Logistics of group work
	2.4. Effects of group dynamics