Design and Technology

2012 Chief Assessor's Report

Government of South Australia

SACE Board of SA

DESIGN AND TECHNOLOGY

2012 CHIEF ASSESSOR'S REPORT

OVERVIEW

Chief Assessors' reports give an overview of how students performed in their school and external assessments in relation to the learning requirements, assessment design criteria, and performance standards set out in the relevant subject outline. They provide information and advice regarding the assessment types, the application of the performance standards in school and external assessments, the quality of student performance, and any relevant statistical information.

Focus Areas

The content of Stage 2 Design and Technology is organised into three focus areas: communication products, material products, and systems and control products.

GENERAL COMMENTS

The spirit of moderation is to support teachers' assessments, since teachers are clearly in the best position to make accurate and valid assessment decisions. In terms of moderation, the moderation panel has been very pleased with the vast majority of student responses in 2012. There is clear evidence of an improvement in student samples for Assessment Type 3: Folio. This has been due to healthy attendance at 2012 clarifying forums, and a great deal of work by teachers to improve their understanding of task design and sharing new learning with other teachers and their students.

Student enrolment in Design and Technology subjects has grown to well above 4000 in 2012, which is an indication that the SACE is meeting the needs of students. In addition, students often achieve their best SACE result in this subject, and the moderation panel believes that this is due to the diligent work from the Design and Technology teaching community.

The range and variety of assessment plans offered in Design and Technology continue to grow, which also indicates a meeting of the diversity and equity of our students. Significant growth areas include textiles in Material Products, and film-making and movie-making in Communication Products.

This year has seen some truly gifted students in Design and Technology, as evidenced by the impressive standard of the merit students. Typically, these high-achieving students have benefited from a structured teaching and learning environment, but also importantly an environment where the teacher has applied pedagogy that encourages student-directed learning.

SCHOOL ASSESSMENT

Assessment Type 1: Skills and Applications Tasks (20%)

The four assessment design criteria for this subject are investigating, planning, producing, and evaluating. Investigating is typically successfully satisfied in the

materials applications tasks when investigating material properties. Planning can be evidenced in both the specialised skills applications tasks and the materials applications tasks; for example, planning the testing regime and the document format in the materials applications tasks. Producing is evident in specialised skills applications tasks. Evaluating is usually evident in the conclusion and analysis sections of the materials applications tasks.

Specialised Skills Application

Typically, successful students provided strong evidence in the relevant assessment design criteria and associated producing performance standards, which included specific features Pr1, Pr2, and Pr3 in the skills tasks.

The moderation panel noted that most often students were able to successfully demonstrate evidence in practical tasks designed to be aligned to their respective context, and to either augment the students' knowledge or prepare them directly for the completion of their major and/or minor products in Assessment Type 2. These tasks were successfully completed by the vast majority of students.

The most successful tasks were structured to allow students to provide evidence of sophisticated engagement in the task. It is important that teachers structure tasks to enable students to demonstrate high levels of achievement against the respective performance standards.

The panel also noted that teachers' marks were easily supported where it was evident that the teacher had interpreted the performance standards consistently. In these cases, it is likely that the students were well informed about the relevant assessment design criteria and their respective performance standards.

The moderation panel noted that successful task sheets provided students with clear information relating to and including at least:

- student requirements for completion
- relevant specific features being assessed
- access to relevant performance standards
- task time lines
- other relevant data, such as access to tools, equipment, and software.

In addition, teachers who provided clear evidence of completion to the moderation panel for each of their students were again able to have their grades easily and efficiently supported. Almost exclusively, this evidence took the form of photographic images that illustrated and supported the grades or marks allocated. For example, where possible, the images showed clear differentiation in standards between outcomes, such as excellent as opposed to poor jointing work, and accurate code-writing as opposed to coding that is missing critical strings. Being selective and careful when selecting images and evidence to present is critical for the students.

Well-prepared learning and assessment plans (LAPs) allowed students to demonstrate achievement at Stage 2 levels against the performance standards. Well-prepared LAPs also included carefully planned activities, followed by an outcome from the student; some examples included a test, programming code, a render, a series of welds, sewing a zip into place, or the building of an electronic circuit. These activities were not major productions, and were listed in the respective LAPs as three to four-week activities. In some cases they were stand-alone activities, not related to

the major or minor products, but most however were skilling activities, designed to equip and prepare students for completion of Assessment Type 2: Product.

The moderation panel noted an example this year in a Systems and Control Products course in which the two skills tasks were (1) to produce a 3D render and orthogonal drawing and (2) to write a basic numeric control (NC) code, in preparation for a CAD/CAM-based major and minor product, where more sophisticated 3D models and coding were required for realisation of the products.

Examples of successful skills tasks within each of the subject's three focus areas include:

Communication Products

- animation sequences
- Photoshop skills
- CADD 3D models, orthogonal drawings and associated renders
- 'small' websites
- 'compact' database and spreadsheet assignments.

Material Products

- small furniture item such as table or cabinet, where two skills tasks were combined, with for example the making of the item, and the finishing sequence
- jointing exercises in wood
- jointing exercises in metal
- metal items such as a Bar Clamp, where the fabrication served as one assessment piece, and the metal turning, the other.

Systems and Control Products

- NC code writing
- introductory programming for a robotics sequence.

Materials Application

The materials applications assignment typically addressed assessment design criteria around investigating, planning, and evaluating. These are mandatory in Assessment Type 1, and fit seamlessly into this assignment.

The moderation panel noted that successful responses included significant testing of the chosen materials, and that the testing was both qualitative and quantitative in nature. As students are required to test and analyse in this assignment, thorough and appropriate testing is required. Successful students graphed their testing results, and used the data in their analytical discussions and conclusions.

The panel believes that is vital that students are encouraged to respond in a full and complete manner to provide opportunities to satisfy the requirements of performance standards at all levels.

Although the contexts vary significantly, the selection of two or more appropriate materials was not an issue. Again, successful responses restricted the number of materials tested to two, and occasionally three.

Good task design demonstrated clear explanation as to the purpose of the task, the selection of materials, the assessment criteria being assessed, time lines, and the reasons for the tests being carried out. Clearly, good responses in this assignment provided opportunities for students to use the results and conclusions obtained to great advantage in both their investigation section of Assessment Type 3: Folio, and in the realisation of their product in Assessment Type 2. A good example is the study of finishing systems in a Material Products course, where there are clear benefits for the seamless application of the chosen material later in the year.

The panel noted that successful responses stayed within the maximum of 800 words, but they used comprehensive sets of images depicting, where possible, the testing being carried out, and of course included the graphing and tables used to collate and analyse the results.

Successful responses this year often followed a structure similar to the one below:

- brief introduction, outlining the materials to be studied, the relevance of the material selection to the student, the selected testing regimes, and reasons for selecting those tests
- brief statement of anticipated outcomes
- brief description of the materials, such as chemical structures, botanical data, and common properties and uses
- test design and description
- execution of the tests, with images
- recording of results
- analysis of results/conclusion.

The moderation panel noted that diverse materials used to manufacture, create, or build the major product for Assessment Type 2 were most successful. Typical materials included physical materials like wood and metal, plastics used for CNC (computer numerically controlled) manufacture, jointing systems, digital file sizes and types, and data in its many forms.

Assessment Type 2: Product (50%)

The three assessment design criteria for this assessment type are planning, producing, and evaluating. Planning is evidenced in the minor and major product records. Producing is evidenced in the major and minor products. Evaluating is evidenced via minor and major product records.

From the subject outline:

> For a 10-credit subject, students create one product that allows them to demonstrate an appropriate range of skills, techniques, knowledge, and ideas. The product is supported by a product record that documents the process, including modifications, planning, and production.
>
> For a 20-credit subject, students create one minor and one major product that allow them to demonstrate an appropriate range of skills, techniques, knowledge, and ideas. The products are each supported by a product record that documents the process, including modifications, planning, and

production. The minor product may be a component of, or designed to complement, the major product.

The product (or minor product and major product) may be a product or system. A product may also be a model, prototype, process, or part.

Students present for assessment the product(s) they have made in response to the design brief developed for their folio in Assessment Type 3. (For a 20-credit subject, a separate design brief may be used for the minor product.)

Many students across the state were successful in this assessment type. It required evidence of work in planning, producing, and evaluating. The moderation panel generally had little difficulty supporting teacher marks or grades against the performance standards in the producing assessment design criteria; for example, student work in Material Products, when accompanied by descriptive sets of images, and a marking scheme, was easily validated.

In addition, successful students in all contexts completed their product records inclusive of sequential images or evidence, accompanied by planning and evaluative comments.

Many successful product records were submitted in hard copy, and included a three-column table. One column was reserved for images, one for any relevant evaluative comments about the production of that part of the product, and the last for any comments about the planning stages of the product. The moderation panel felt that this format was a very successful and readable assessment task.

It was critical for teachers to ensure that the products chosen would allow students to work at Stage 2 standard, meaning that their work would contain enough depth and rigour to satisfy evidence at the highest possible grade in all assessment design criteria. The moderation panel saw a very small number of assessment plans where students produced work successfully, but that work was not of sufficient standard to allow results in the A and B grades levels.

The moderation panel wishes to encourage teachers and students not to provide volumes of work in their product records. It has never been the intention to require this level of response. While it is a mandatory requirement that full and complete product records are supplied for both major and minor products, a sensible balance must be kept. Four to six images with accompanying comments for a minor product and ten to twelve for a major product were provided in most successful courses.

Teachers are required to ensure that the product records demonstrate evidence of completion of each product.

Alternative Product Record Submissions

Typically, both minor and major product records were submitted in hard copy; however, other formats have proven equally as effective. For example, students in a Communication Products course might choose to submit a screen-capture AVI file, inclusive of audio, as their product record. The moderation panel acknowledges how informative and inclusive this form of submission can be. When used effectively, the carefully scripted response not only illustrated the sequential nature of the product, but gave opportunities to the students to provide evaluative comments during their presentation. Examples that used this method included:

Communication Products — Photography

In this case, the student had developed/digitally imaged a set of images from their initial status to completion, using a range of Photoshop techniques. Description of these techniques is often difficult and time consuming as screen shots or similar. The student was then able to demonstrate the sequential planning of the images, as well as providing evaluative comments as they tested and modified their product.

Communication Products — Game-making

In this case, the moderation panel quickly gained an insight via the product record into the production methods and sequences used by this student. Clearly this was achieved in a far more meaningful and informative manner than was possible in hard copy. Accompanied by the student's evaluative comments, the teacher's grade was easily and effectively supported.

Systems and Control Products — CNC Manufacture and CAD/CAM

This course was successful supported as the students carefully presented the sequence of CAD to create the 3D model, followed by a description of the file transfer protocol into the CAM software. Then came the positioning of the model on the correct plane, the allocation of tool paths, including speeds, feeds, depths of cut, step-overs, and so on. The students were able to simulate two scenarios and include evaluative comments about the geometry and the CAM settings. The sequential nature of the product record also provided evidence toward planning.

The moderation panel also noted a particularly successful student response, which required the design and subsequent realisation of an exhaust system for a conventional motor vehicle. This provided excellent opportunities throughout the course, as the student was skilled in tube-bending and fabrication techniques in Assessment Type 1, as well as being able to investigate materials for manufacture in the materials application task. The system was manufactured in Assessment Type 2, and the design of the system formed part of Assessment Task 3.

Examples of other successful responses included:

Communication Products

- calendars exhibiting student photography
- web pages exhibiting student photography
- game-making
- image construction, augmented by an interactive tutorial outlining the production methods used
- animations
- web pages
- graphics/industrial design
- CADD
- 3D modelling, prototyping, and associated orthogonal and rendered drawings.

Material Products

- large to medium-sized framed and carcase construction furniture products
- beds
- textiles — a range of clothing, such as a dress for the formal

- metal braziers/outdoor heaters
- barbecues
- Weight benches
- holding/clamping devices.

Systems and Control Products

- robotic, programmed solutions
- CADD/CAM used to develop a range of prototype products, and associated drawings
- injection moulding tools
- the realisation of an exhaust system.

Major and minor products differ only in their respective depth and rigour, usually set by the teacher. The moderation panel saw many successful responses for both products in all contexts. The better responses often provided evidence of significant teacher–student negotiation in both the task-setting and the assessment of the task.

For example, a game-making student clearly had explained to their teacher what their design and building intentions were prior to commencement; the result is a negotiated task, still within the scope of the LAP. This type of student-directed learning, the moderation panel notes, almost always resulted in successful outcomes. This was the case for both major and minor tasks.

The moderation panel noted that a high percentage of students were successful in this task.

EXTERNAL ASSESSMENT

Assessment Type 3: Folio (30%)

From the subject outline:

> The folio consists of documentation and analysis of the product design process and product evaluation.
>
> For both a 10-credit subject and a 20-credit subject, the investigation section of the design process includes an analysis of the impact of the product or system, and/or technologies related to it, on the individual, society, and/or the environment.
>
> For a 10-credit subject, students undertake and document one product design process and one product evaluation for the product in Assessment Type 2.
>
> For a 20-credit subject, students undertake one product design process and one product evaluation for the major product in Assessment Type 2. For the minor product, students do not include a separate design brief in the folio. The design brief for the minor product may be based on the design brief for the major product, or may be provided by the teacher.
>
> This assessment type is designed to enable students to further develop and refine their use of the design process. They investigate technical skills,

analyse possible applications of these skills, and evaluate ways in which their own skills have developed and improved.

In 2012, most students chose to respond to this assessment task in a word-processed document (on A4 paper stapled at the top left-hand corner), with a maximum of 2000 words (20-credit subject) or 1000 words (10-credit subject), as documented in the subject outline. Word-counts should be verified by the teacher before submission to the SACE Board. Students who chose to present the folio in electronic format should give consideration to how the folio was modelled to suit the format. Some responses to this assessment task presented as PowerPoint documents would have been better presented as word-processed documents. Unless accompanied by an oral recording or notes pages, many of the PowerPoint folios used in this assessment type were ineffective as a presentation method.

Student names or school names/logos should not be included. Teacher-prepared support material or course notes should also not be included. It was noted that teacher-prepared scaffolding often restricted the students' ability to show their full potential. Students who used correct SACE subject outline descriptors were more likely to address the criteria successfully.

The discussion that follows is divided into the assessment design criteria and specific features that the folio is assessed against.

Investigating

Identification of a Need, Problem or Challenge

The marking panel acknowledged that most student responses were able to establish a clear need for the product. An imaginative 'need' identification assisted students to later be creative in the development of their product. The established need and relevant design situation were normally closely linked to the design brief, unpacking the student's intentions. Most responses were able to provide a statement of intent based on an identified need.

Investigation and Critical Analysis of the Characteristics of Existing Products, Processes, Systems, and/or Production Techniques

Responses varied depending on the focus area. It is expected that this analysis be closely linked to the design brief. The more appropriate responses analysed existing products using design principles relevant to the focus area. For example, a review of existing furniture might include examining the variables of size, cost, physical description, aesthetics, materials, joint types, hardware used, ergonomics, proportion, and line. On the other hand, critical analysis of photography might include composition, cropping and the elements of design such as line, shape, tone, texture, pattern, and colour. Desktop publishing might include analysis of size and style of font, spacing between letters and words, line spacing, white space, and visual elements, along with analysis of the impact of graphics and visual cues. Where images of existing products are used which are not the work of the author, each must be clearly referenced and acknowledged.

Production techniques were best analysed using graphical techniques such as screen shots and images with annotations. Some responses presented specifications of tooling from technical publications. Such an approach was not considered appropriate and often did not add to an understanding of the student's intentions.

Investigation of Product Material Options and Analysis for Product Use

While some students effectively analysed a range of material options for use in their product, the majority listed the materials that they had predetermined to use. When determining material options, a reference to the results of the materials application investigation in Assessment Type 1 would be adequate and advantageous. Materials investigated will be dependent on the focus area studied and might include file formats, fabrics, paper types, or finishes. This section should not include a survey of tools to be used.

Investigation into the Impact of Products or Systems on Individuals, Society, and/or the Environment

The better responses clearly identified at least one issue of concern related to their product. Such responses provided a clear introductory paragraph, a number of paragraphs of discussion and a summary or conclusion. Those investigations that displayed focus, perception, and depth of knowledge were also referenced appropriately.

Planning

Analysis of Information to Develop Appropriate Solutions to an Identified Design Brief

The marking panel found that the better responses analysed their investigation. This analysis resulted in a range of possible solutions that were imaginative, innovative, and enterprising. From this range, the best responses then went on to identify and explain the most appropriate possible solution. This identification was based on how well each proposal satisfied their initial design criteria.

Regardless of the focus area, many students placed too great an emphasis on presenting the outcome without fully addressing all possible options in the planning stages. For example, in a Communication Products course based on CAD/CNC, the NC outcome was provided without fully addressing all CAD options.

To be concise, communication should be graphically based with clear annotations. Initially, sketches are appropriate, but as a student moves closer towards a final outcome, it is expected that drawings will become more detailed and that the student will show an understanding of drawing conventions relevant to the focus area.

Students who were able to synthesise their own information could generally meet the performance standards to a higher level than those who used teacher-generated proformas such as cutting/materials lists.

Testing, Modification, and Validation of Ideas or Procedures

The best responses detailed results during assembly. Depending on the focus area such detail might include, for example, interference reports during CAD assembly, circuit testing in electronics, simulation of CNC operation, trial assembly in a workshop, and Flash error reporting and troubleshooting during multimedia production or network testing.

Such validation needs to be relevant to focus area conventions and documented clearly. Complete product records are not required.

Evaluating

In general, the markers felt that it would have been beneficial for responses to include an image of the finished or nearly finished product.

Evaluation of Product Success against Design Brief Requirements

The best responses evaluated the product objectively using initial design criteria established during the investigation. This process helped the student to make qualitative statements about how design criteria could have been better fulfilled. Such comments were considered insightful.

Evaluation of the Effectiveness of the Product or System Realisation Process

Students used this section as a forum to detail the strengths and weaknesses of their product or system, and students provided a brief indication of the depth of their engagement in the process.

Reflection on Materials, Ideas, or Procedures, with Recommendations

The best responses noted any shortcomings throughout the project and suggested means by which those shortcomings would not be repeated.

Analysis of the Impact of the Product or System on Individuals, Society, and/or Environment

The foremost question students tended to pose was 'Does the product work?' However, the best responses reflected on their investigation into the impact of products or systems on individuals, society, and/or the environment. Such responses included considered statements discussing topics such as the life cycle of the product, the recyclability of the product, the product's ecological footprint, or how the user's life is made better by the product. The best responses were related to global importance.

OPERATIONAL ADVICE

Several very useful resource materials are already available on the SACE website, and, as a result of these recent rounds of marking and moderating, new materials have been generated.

Participating in the marking and/or moderation processes is a valuable form of training and development. Teachers are encouraged to consider participating in 2013.

Teachers may wish to consider using digital submission of work. All student responses can be submitted as Word files or similar, as long as they can be accessed. Please refer to the Submission of Electronic Files document on the SACE website. Digital submission opens up new and perhaps more effective means of communicating responses. For example, written work can be bookmarked, to take the reader seamlessly to support materials like images, tables, charts, and so on. Audio files can also be effectively used.

Teachers should ensure that all student work is submitted as requested by the SACE Board. A small number of schools were not able to provide evidence in some assessment types.

Schools need to ensure that in Assessment Type 1:

- all tasks have evidence of completion, typically via quality images supporting the teacher grade
- associated marking schemes for each student are included
- assessment task sheets are provided
- a copy of the LAP is included
- all tasks are labeled clearly.

Schools need to ensure that all student work for Assessment Type 2 is provided. This includes:

- evidence of completion, typically via images or digitally via AVI files or similar
- comprehensive but monitored product records for both major and minor products.
- product records to include photographic evidence and evidence of evaluative comments and planning.

Teachers should ensure that, for any changes to the learning and assessment plan, the changes are acknowledged on the addendum and signed by the principal or the principal's delegate.

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