

4 Assessing capability

4.1 Identifying levels of attainment

Each school is required to report the level of attainment in design and technology achieved by each student at the end of Key Stage 3. This is achieved by finding the level description that best matches each student's performance! There is a wide range of evidence to be drawn from their work across the Key Stage indicating the progress they have made. As several teachers will have taught each student and will be involved in making this assessment, it is important that all teachers in a department are very familiar with, and have a shared understanding of, these level descriptions.

The Nuffield approach to this is for the department to build up portfolios of individual student's work which can be matched to specific level expectations. These have proved to be a valuable tool for staff as an aid to agreeing on common standards and a benchmark to facilitate teacher assessment, and for students, to see clearly what they are being expected to achieve.

A portfolio of a student's work should usefully include a statement which captures aspects of individual capability demonstrated throughout the Key Stage, and which will help staff decide which level description best fits the student's performance over a range of projects. In this way, you will have the evidence for the student to attain at the highest level commensurate with their individual abilities, as demonstrated in their work across the Key Stage.

Here are three examples of student's work undertaken across Key Stage 3. Clearly, they provide just a snapshot from a much broader range of information and experience which teachers will have about each student. But, they should help you to create a picture of four different individuals, their strengths and weaknesses in performance across a range of contexts and over a period of time. More detail is given for each of the Year 9 tasks followed, to illustrate the kind of specific comments you could make to describe the more general statements of the level descriptions.

As you read these summaries, consider the appropriateness of the range of activities that they have undertaken and form a view as to which level description you feel provides the best fit.

Ben, Hannah and Tim are all 14-year-old students in their final term of Year 9, from a range of schools. Over the Key Stage, each of them has worked across the full range of activities described in the Programme of Study: Resource Tasks, product analysis and Capability Tasks. These have covered work in resistant materials and components, systems and control, food and textiles.

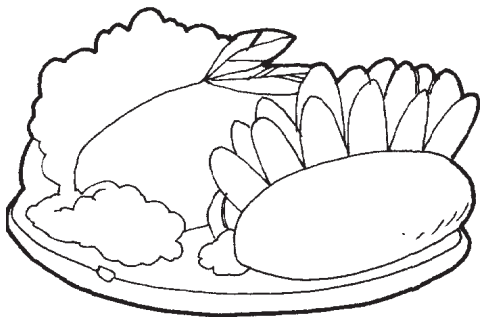
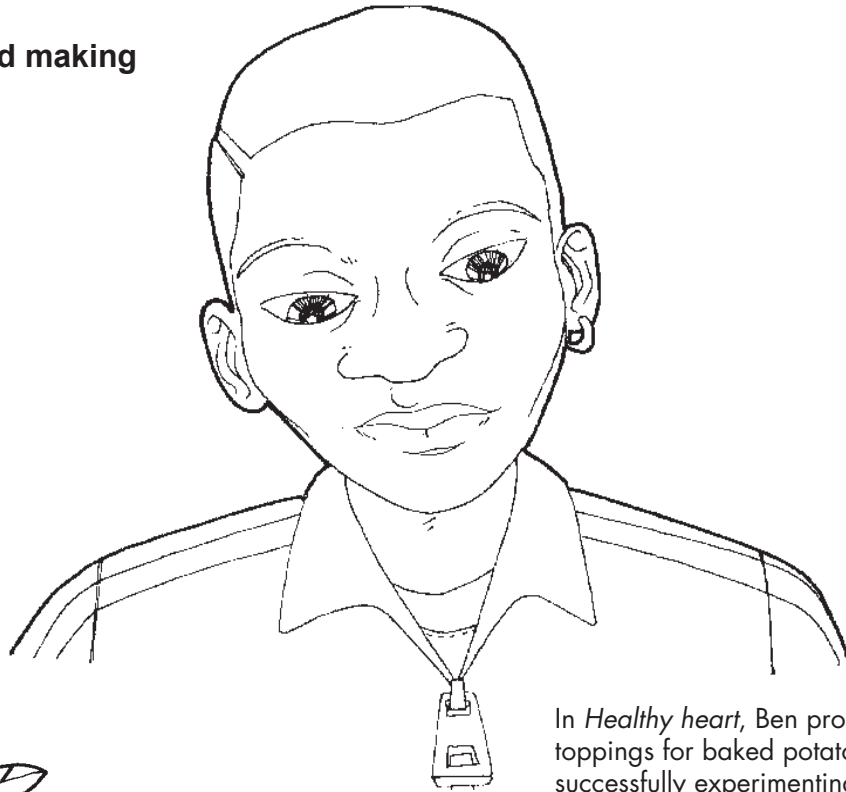
They have all completed a large number of focused Resource Tasks, working in these materials, and a number of more general Resource Tasks, covering designing and communicating skills. These have been largely teacher-directed activities aimed at developing particular knowledge, skills and understanding.

During this time, each has completed between eight and ten Capability Tasks. Each of these has provided good opportunities for them to demonstrate their design and technology capability and to apply the skills learnt in these more focused activities.

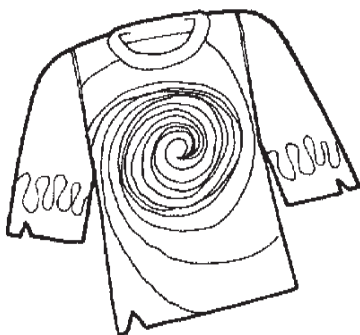
Ben

In Years 7 and 8, Ben completed six Capability Tasks, working for approximately 12 weeks on each.

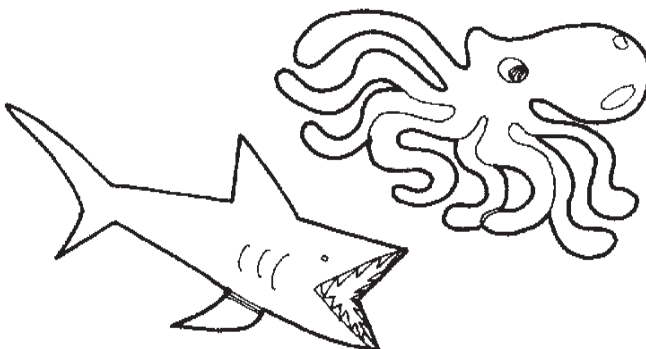
Ben's designing and making in Year 7



In *Healthy heart*, Ben produced toppings for baked potatoes, after successfully experimenting with a good range of fillings. He worked safely and independently in the kitchen and repeated his menu at home. He completed a well-written evaluation based on the 'user trip' Resource Task.



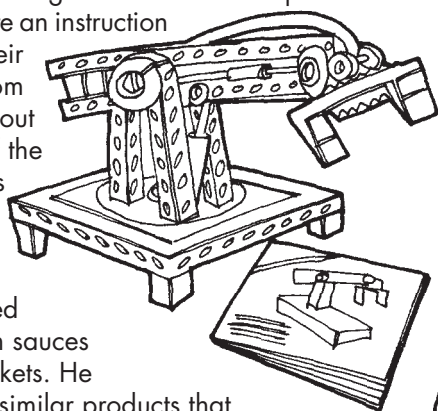
In *T-tops*, Ben made a top to wear on his holidays. Using a pattern supplied by the school he was able to make basic alterations to the sleeve and body lengths. After being taught four alternative decorative techniques, he used tie and dye to produce a pleasing end product.



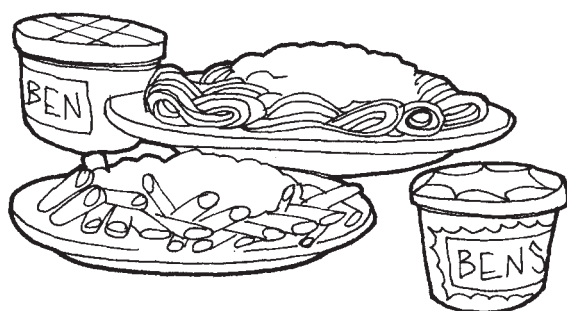
In *Novelties Inc.* Ben used ICT to research and investigate marine life as the basis for fridge magnet design suitable for sale in a local garden centre or aquarium. He was able to mark out, cut and shape his design in copper sheet with a satisfactory level of accuracy, before decorating it with brightly coloured enamels.

Ben's designing and making in Year 8

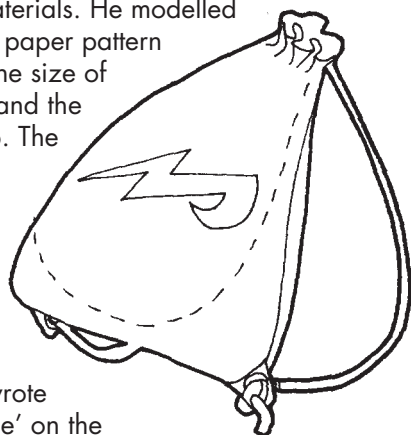
In *Robots are Go!* the task for Ben and a partner was to design and make a pick-and-place robot controlled through a computer interface. The mechanical and electrical components were provided and Ben and his friend worked through some Mechanical and Computer Control Resource Tasks and built up an understanding of the basic concepts of control technology. They wrote an instruction booklet for their robot and their teacher invited students in from a local primary school to test out the robot and the usefulness of the instruction booklet. Ben was proud to share his work with them.



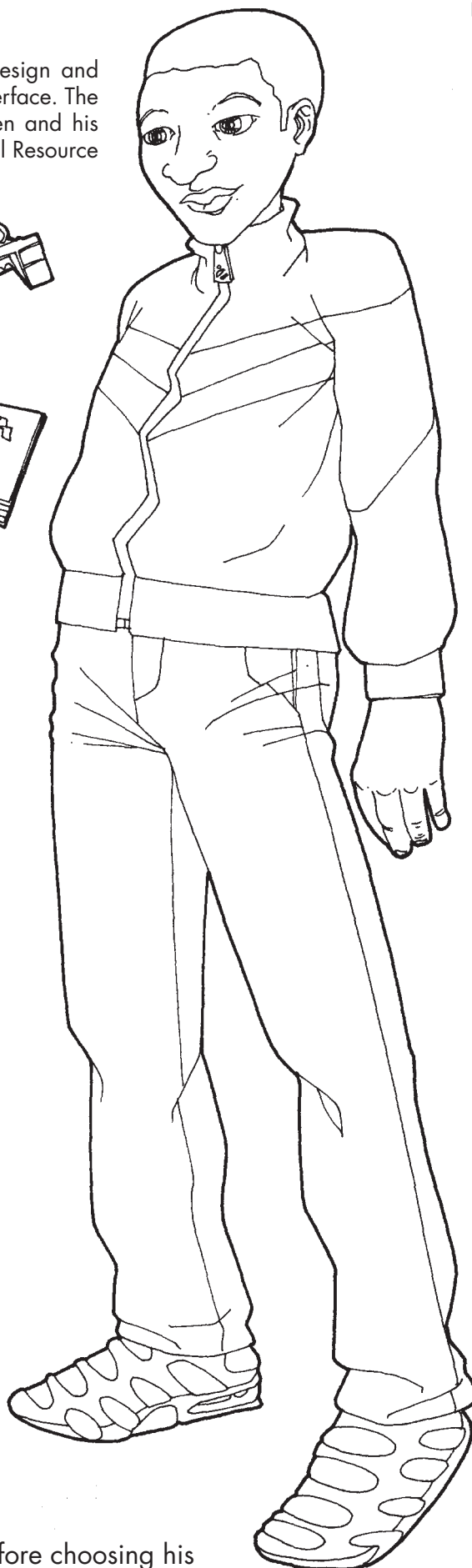
In *Better food*, Ben was required to research the types of cook-in sauces available in different supermarkets. He worked in a group to prepare similar products that could be sold in a local supermarket. This involved making different pasta sauces and designing and making suitable packing, including decorative labels and tops for the jars.



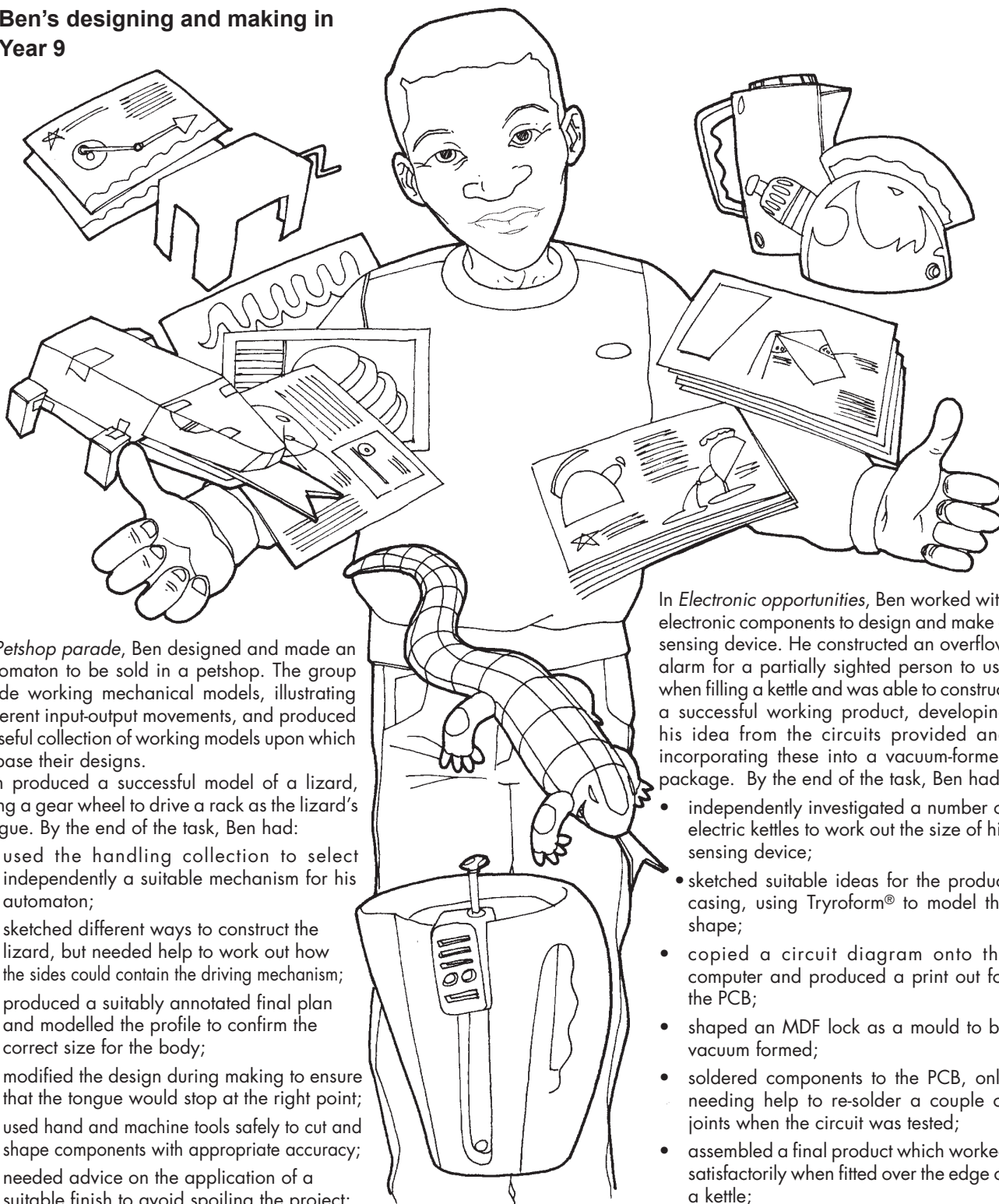
In *Carrier bags*, the group researched a wide range of carrying devices before deciding on a personal need. Ben decided on a lightweight bag which he could carry over his back whilst cycling. Resource Tasks were used to investigate different fastenings and to compare the properties of different materials. He modelled his ideas as a paper pattern to determine the size of the container and the length of strap. The final product was made in cotton, with Velcro® fastenings. For the outside of the bag, he wrote 'Tour de France' on the computer and downloaded it to a vinyl cutter to produce an iron-on transfer.



In Year 9, Ben tackled two more Capability Tasks before choosing his GCSE options. Each was of 15 weeks duration, giving the students the opportunity to work in more depth than in Years 7 and 8.



Ben's designing and making in Year 9



In *Petshop parade*, Ben designed and made an automaton to be sold in a petshop. The group made working mechanical models, illustrating different input-output movements, and produced a useful collection of working models upon which to base their designs.

Ben produced a successful model of a lizard, using a gear wheel to drive a rack as the lizard's tongue. By the end of the task, Ben had:

- used the handling collection to select independently a suitable mechanism for his automaton;
- sketched different ways to construct the lizard, but needed help to work out how the sides could contain the driving mechanism;
- produced a suitably annotated final plan and modelled the profile to confirm the correct size for the body;
- modified the design during making to ensure that the tongue would stop at the right point;
- used hand and machine tools safely to cut and shape components with appropriate accuracy;
- needed advice on the application of a suitable finish to avoid spoiling the project;
- spoken briefly about his design to the rest of the group, recognising the main strengths and weaknesses of his design.

In *Electronic opportunities*, Ben worked with electronic components to design and make a sensing device. He constructed an overflow alarm for a partially sighted person to use when filling a kettle and was able to construct a successful working product, developing his idea from the circuits provided and incorporating these into a vacuum-formed package. By the end of the task, Ben had:

- independently investigated a number of electric kettles to work out the size of his sensing device;
- sketched suitable ideas for the product casing, using Tryroform® to model the shape;
- copied a circuit diagram onto the computer and produced a print out for the PCB;
- shaped an MDF block as a mould to be vacuum formed;
- soldered components to the PCB, only needing help to re-solder a couple of joints when the circuit was tested;
- assembled a final product which worked satisfactorily when fitted over the edge of a kettle;
- recognised the difficulty of making a waterproof casing to ensure that the product would withstand constant use.

By Whitsun in Year 9, the school required students to confirm their GCSE options, and Ben chose to study design and technology: Resistant Materials Technology. The department regrouped the students and gave them the opportunity to try out their chosen option during the remainder of Year 9. During these weeks, Ben undertook a number of Communication Resource Tasks, giving him the chance to improve his drawing and modelling skills and then making a mock-up of a battery-powered light to use for model making.

On this evidence, what level of attainment would you give Ben?

Hannah

In Years 7 and 8, Hannah, like Ben, completed six Capability Tasks.

Hannah's designing and making in Year 7

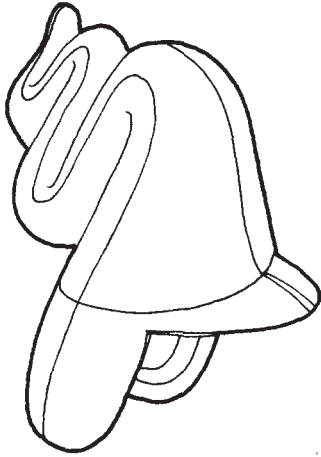


In *Rainbow Radios*, Hannah worked in a team of four to assemble a simple working radio from a kit of parts, forming a small production line to share out the tasks required. She had to design and make a shell to house the radio, suitable for sale in the giftshop of a hotel chain. She used a stiff card box, constructing an accurate net to which she added a cutout profile of a hotel as the radio front. She then printed the name of the hotel and drew windows and doors using ICT to complete a successful working product.

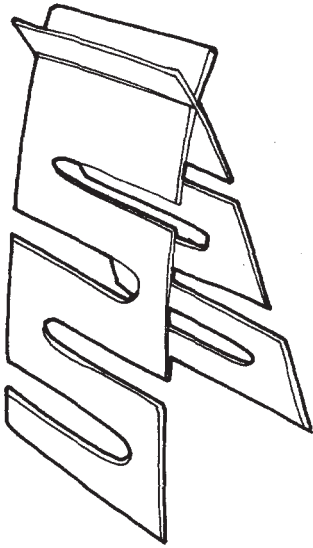
In *Novelties Inc.*, Hannah learnt basic making techniques and how to adapt existing recipes. Her final task was to batch produce a dozen small cakes or biscuits and she chose to decorate them with simple icing techniques on a flower theme. Hannah worked confidently in the kitchen, having had considerable experience of food in her primary school. Her final products were all of a high and consistent quality.

In *Special effects*, Hannah's task was to design and make a small-scale controllable vehicle suitable for a science fiction film. Resource Tasks gave Hannah a good understanding of basic mechanical and electrical control. The project involved teamwork to agree on the appearance of the vehicle and the way it would work. Each group's model was video-taped crossing a film set. Her group produced a well-presented model but it only moved in a straight line, powered by a single motor. But for the second project the quality of finish was good, helped by the card modelling of their first project.

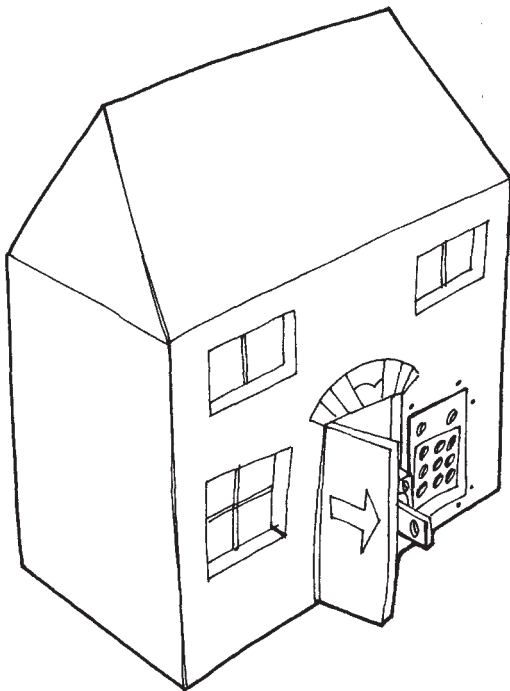
Hannah's designing and making in Year 8



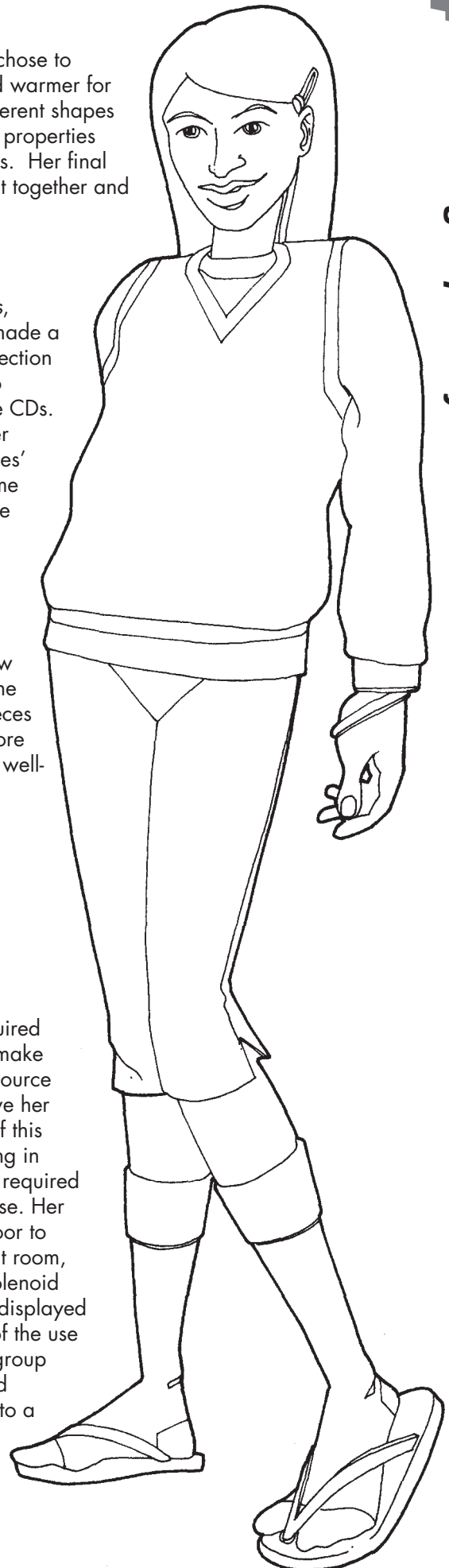
In *Hot comfort*, Hannah chose to design and make a head warmer for herself. She tried out different shapes and tested the insulation properties of different woven fabrics. Her final product was carefully put together and fitted well.



In *Display your treasures*, Hannah designed and made a display system for a collection of objects. She chose to display her five favourite CDs. Her teacher provided her with some 'starter sketches' to give her ideas for some interesting structures. She developed one of the ideas in thin plywood, first modelling it in card to be sure of the correct dimensions. She learnt to use the electric fretsaw to complete the task. She stained the plywood pieces in bright woodstain before assembly to complete a well-finished product.



Smart card security required Hannah to design and make a security system. A Resource Task on smart cards gave her a fuller understanding of this new technology. Working in teams, each group was required to simulate a potential use. Her group made a model door to control entry to a student room, requiring the use of a solenoid lock. Her project folder displayed a good understanding of the use of smart cards and the group successfully incorporated technical components into a working model.



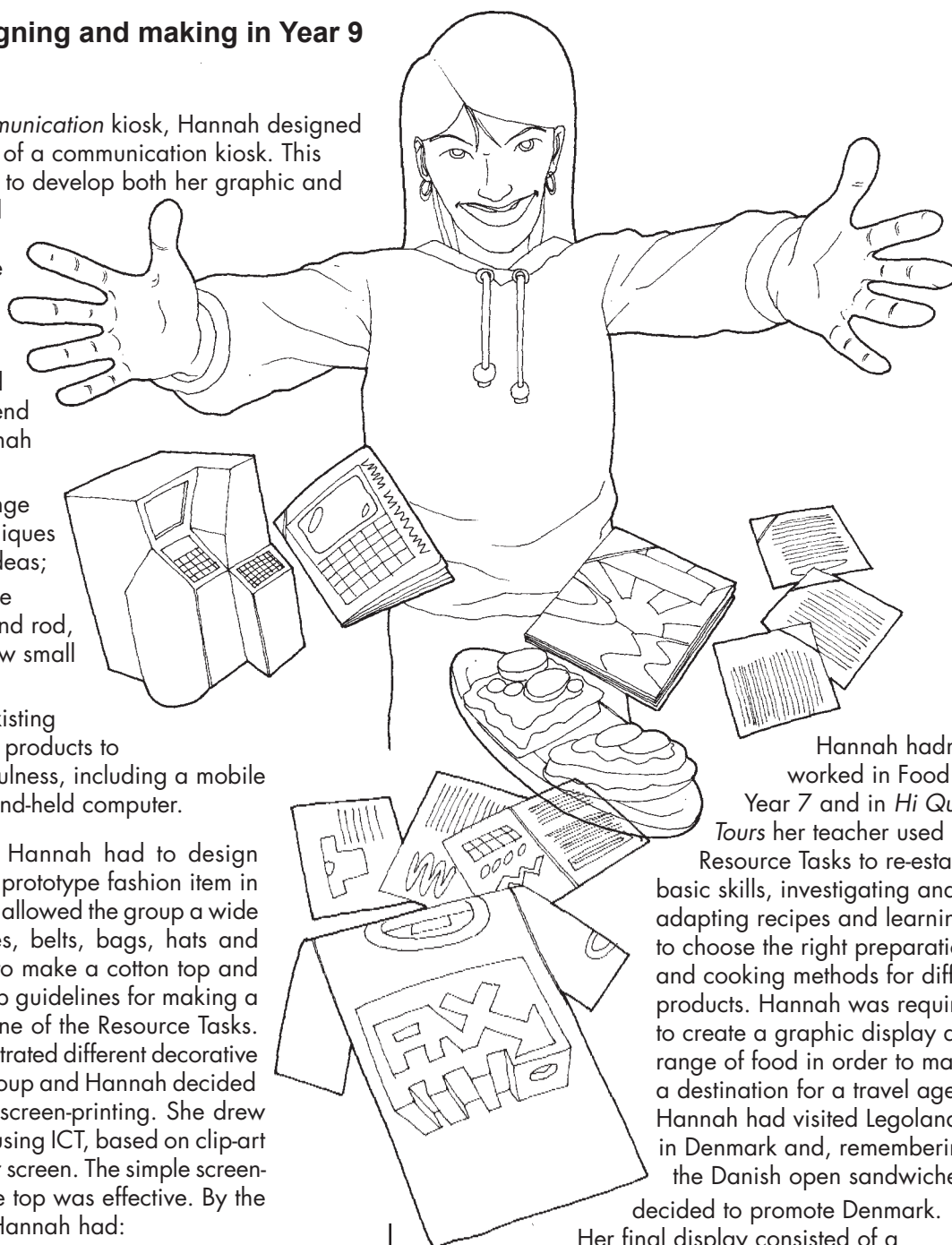
Hannah's designing and making in Year 9

In *Information communication* kiosk, Hannah designed and made a model of a communication kiosk. This was an opportunity to develop both her graphic and modelling skills and to be creative in a visual way, and she chose to design a booth in which it would be possible to enjoy both sound and vision. By the end of the project, Hannah had:

- developed a range of graphic techniques to express her ideas;
- produced a scale model in card and rod, using ICT to show small detail;
- analysed two existing communications products to assess their usefulness, including a mobile phone and a hand-held computer.

In *Strut your stuff*, Hannah had to design and manufacture a prototype fashion item in textiles. Her teacher allowed the group a wide choice from scarves, belts, bags, hats and tops. She decided to make a cotton top and used the step-by-step guidelines for making a T-shirt style top in one of the Resource Tasks. Her teacher demonstrated different decorative techniques to the group and Hannah decided to experiment with screen-printing. She drew an abstract design using ICT, based on clip-art images, and cut her screen. The simple screen-printed block on the top was effective. By the end of the project Hannah had:

- developed her own pattern from that provided;
- used ICT effectively to design for screen-printing;
- produced samples of different stitching techniques, using the sewing machine confidently, and kept a full record of her experiments in her project folder;
- developed competent making skills;
- demonstrated confident use of screen-printing techniques;
- taken part in an 'in class' fashion show;
- a good understanding of constructional techniques: for example, reflecting on the advantages of using an overlocker.



Hannah hadn't worked in Food since Year 7 and in *Hi Quality Tours* her teacher used some Resource Tasks to re-establish basic skills, investigating and adapting recipes and learning to choose the right preparation and cooking methods for different products. Hannah was required to create a graphic display and a range of food in order to market a destination for a travel agency. Hannah had visited Legoland in Denmark and, remembering the Danish open sandwiches, decided to promote Denmark.

Her final display consisted of a carefully presented display panel advertising Danish holidays, open sandwiches topped with a range of tempting meats and fish, and a well-produced folding A4 leaflet created professionally using DTP. By the end of the project Hannah had:

- researched widely, using the public library, the Internet and written to the Danish Tourist Board;
- investigated different ways in which food can be preserved and served;
- produced a comprehensive leaflet, using digital images and DTP software;
- worked confidently and competently in the kitchen;
- designed her own preference test and set up a tasting panel.

On this evidence, what level of attainment would you give Hannah?

Tim

In Year 7, in order to fit four Capability Tasks into the year, Tim's teacher used different strategies to shorten the time spent on each task, and by the end of the year, Tim had completed four different products.

Tim's designing and making in Year 7

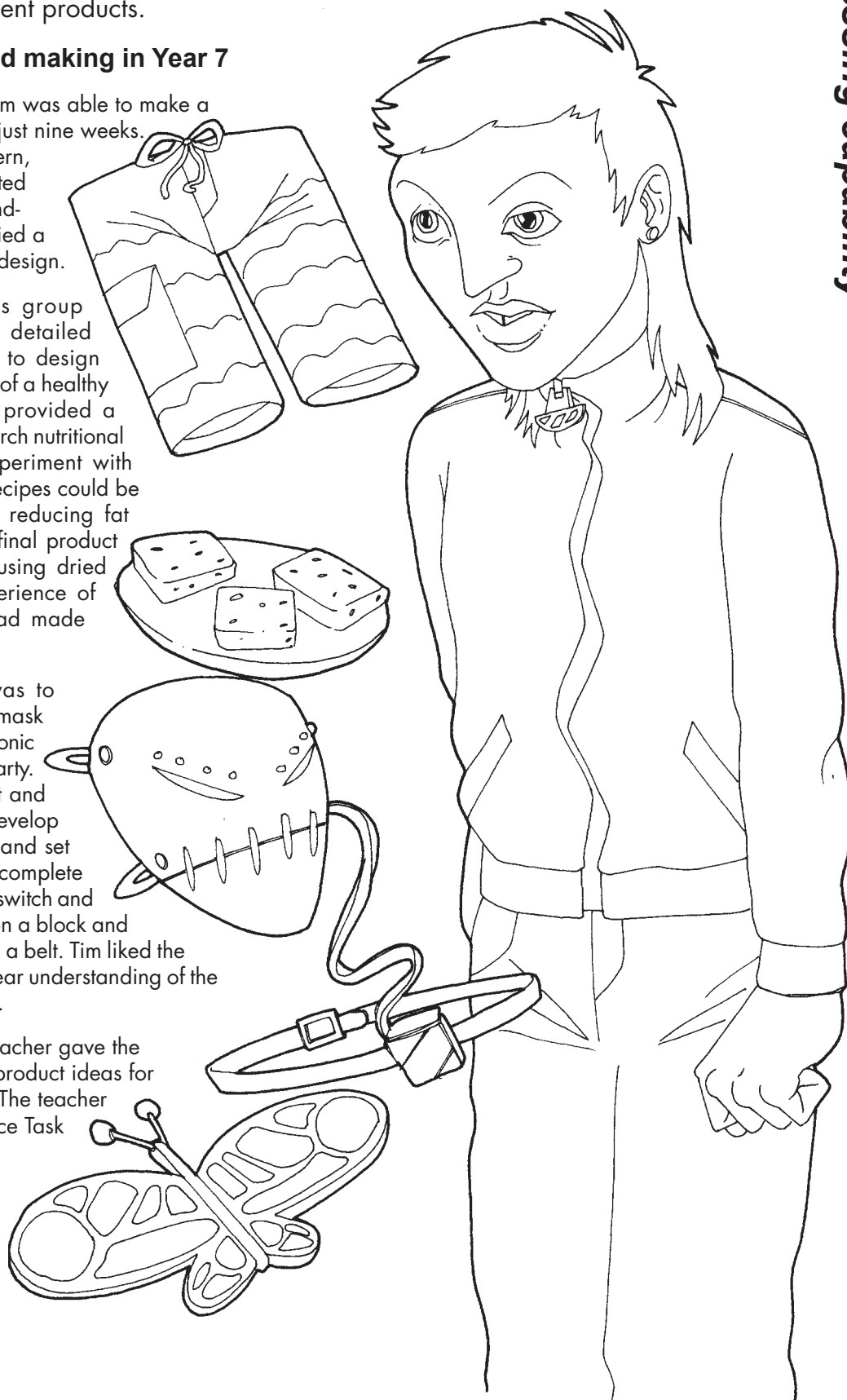
In Long and short of it, Tim was able to make a pair of holiday shorts in just nine weeks.

He used an existing pattern, altered it slightly, decorated the fabric using the tie-and-dye technique, and applied a patch pocket of his own design.

In Healthy heart, Tim's group was given a brief and detailed specification. They had to design and make snacks as part of a healthy eating campaign. This provided a good opportunity to research nutritional requirements and to experiment with ways in which existing recipes could be improved: for example, reducing fat or increasing fibre. His final product was a tasty snack bar using dried fruits. For his first experience of food technology, Tim had made excellent progress.

In Masks, Tim's task was to design and make a face mask incorporating simple electronic effects for a Hallowe'en party. This was a group project and he worked in a team to develop a vacuum-formed mould and set up a production line to complete the electrical circuits. The switch and batteries were mounted on a block and attached with Velcro[®], to a belt. Tim liked the group work and had a clear understanding of the type of circuitry required.

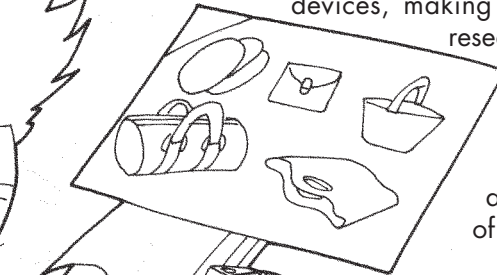
In Novelties Inc., Tim's teacher gave the group basic sketches of product ideas for sale at a garden centre. The teacher demonstrated the Resource Task Stripy jewellery, and the group made a variety of products using this technique. Tim's final product, a butterfly-shaped brooch, was carefully finished and polished.



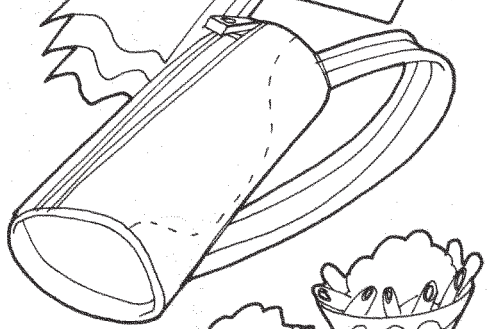
Tim's designing and making in Year 8



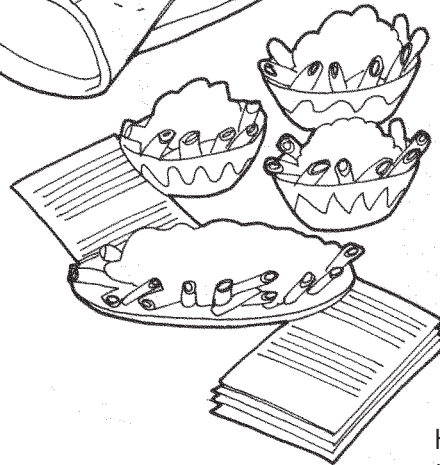
In *Carrier bags*, Tim had to design and make a simple personal carrying device. He was expected to undertake more in-depth research and collected a wide range of different illustrations of carrying devices, making up an image board of his research. He decided to make a



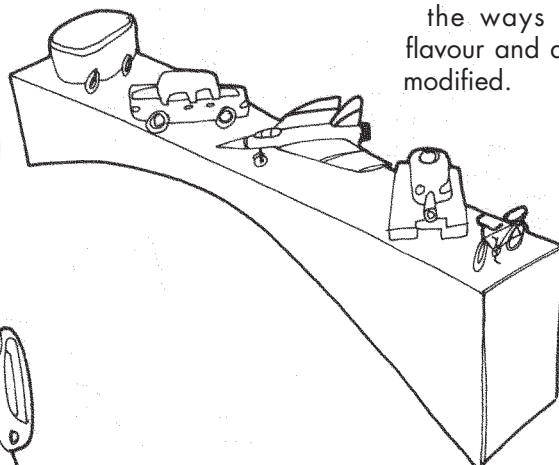
shoulder bag to carry his sports kit and his experience with the sewing machine in Year 7 stood him in good stead and he made a competent job of completing his bag.



In *Better food*, Tim had to design and make an improved pasta product; again he enjoyed the chance to research into existing solutions. He visited local supermarkets and quite independently looked at their websites to investigate their products further. Tim prepared thoroughly for his practical lessons and undertook several trial runs before settling on his chosen dish. As the project developed, he became able to draw useful flow charts to guide his practical activity.



His final product demonstrated a thorough understanding of the ways in which the texture, flavour and aroma of sauces can be modified.



In *Display your treasures*, Tim had to design and make a display system for 'collectables'. The group experimented with thin sheet materials, rods and tubes to construct lightweight, visually interesting structures. Tim decided to display a collection of scale model vehicles, building a bridge type structure to display the items. He put considerable effort into completing the project, using the materials carefully and effectively.

In Year 9, Tim had the option of working first in either resistant materials or control and then in either food or textiles. These represented the four GCSE options offered in the school. After Whitsun, students moved into their GCSE options, as in Ben's school. Tim chose control and, in the last half term, undertook a number of Resource Tasks in preparation for his GCSE course.

Tim's designing and making in Year 9

In *Electronic opportunities*, Tim was able to build upon his knowledge gained making masks in Year 7 to complete confidently the Resource Tasks set, and then chose to design and make a frost alarm for his father's greenhouse.

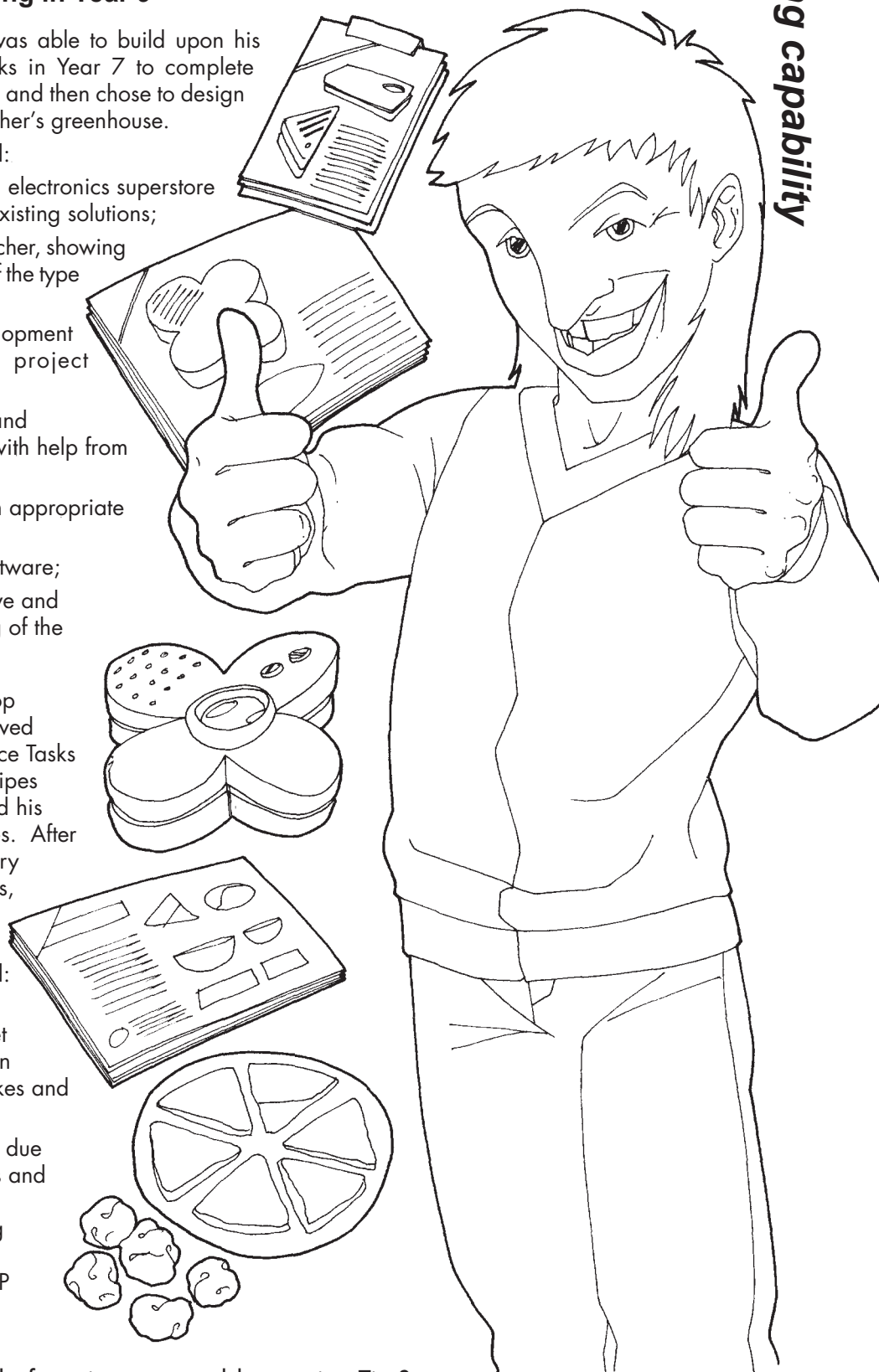
By the end of the project, Tim had:

- undertaken research in a local electronics superstore to develop his knowledge of existing solutions;
- discussed his ideas with his teacher, showing a high level of understanding of the type of circuit required;
- recorded his ideas and development of the project clearly in a project notebook;
- used PCB software to design and subsequently produce a PCB with help from the technician;
- incorporated his circuit into an appropriate container suitable for the task;
- tested his circuit using PCB software;
- showed a high level of initiative and knowledge and understanding of the construction of circuits.

School trip required Tim to develop food products which could be served during a school field trip. Resource Tasks on nutritional analysis and on recipes involving wrapping food extended his knowledge of different possibilities. After experimentation and use of sensory evaluation tests with other students, the group prepared sample foodstuffs to meet the brief.

By the end of the project, Tim had:

- developed alternative fillings and casings for pasties and set up thorough sensory evaluation tests to determine individual likes and dislikes;
- worked methodically and with due regard for hygiene regulations and the risks involved in preparing food, transporting it, reheating and serving it, showing a good understanding of HACCP procedures.



On this evidence, what level of attainment would you give Tim?

4.2 Marking, assessment, record keeping and reporting

It will be important for both the teacher and the student to keep records showing which Resource Tasks have been completed, which Case Studies have been read and which Capability Tasks have been tackled. You can use the Checklists downloadable from the Nuffield Secondary Design & Technology website for this purpose. It is important that the student understands how to make best use of this work in developing her or his attainment in design and technology.

The advice from the Nuffield Project based on good research evidence* is: assess your students' work, don't mark it.

- Conversations supported by short written comments during Resource Task and Case Study work will be useful.
- Conversations supported by short written comments during Capability Tasks will be useful.
- Key comments after the second review, the 'Red pen day', as described in section 2.9, page 27, will be useful.
- Identifying clear targets for improvement by helping students use the self-assessment sheets will be useful.
- The portfolio summaries of students' achievements described in the first part of this chapter give ample evidence for you to report what each student has done, how well they have done it and what they should do to get better.

It has been noted that 'Teachers are caught up in a culture of diligence. The recording of assessment data has become a burden because teachers do it so well.'** The Nuffield approach to assessment will reduce the burden and allow diligence to be focused so that it is not wearisome.

* *Assessment and Classroom Learning*, Paul Black and Dylan Wiliam, *Assessment in Education Vol 5. No.1 1998*

** *Carol Adams, Chief Education Officer, Shropshire County Education Office, in All Our Futures: Creativity, Culture and Education; National Advisory Committee on Creative and Cultural Education, DfEE 1999*

base of the box.