Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

Title of Project: KolourKase
Group Name: JACS
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1. Problem Finding

1) Students spend a lot of time looking at their phones for long periods of time each day. Thus, the students will face constant exposure to UV rays that are emitted from smartphones. This will cause the students' eyesight to deteriorate.
How we came up with this problem: We see a lot of students looking at their phones every day in the canteen while queuing up to buy our food. We have also asked our classmates and have found out that many students in our class wear glasses and have a high eye degree.
2) Students use their handphones to check social media or play games. These activities are highly addictive. So, when they use their phones, they will find it hard to know when to stop to rest their eyes. This leaves them with lesser time to do homework and less social time with friends.
How we came up with this problem: We have experienced how addictive it is to play games. When we lose a game, we would play another to redeem ourselves. When we win a game, we would want to play again as we think that we can win easily again. This made us forget about what we were supposed to do homework. Because of this, we might stay late into the night to finish our homework.
3) When students start using their phones, they will be engrossed and will be oblivious to their surroundings as they are focused on their mobile devices. Thus, they will be more likely to be involved in accidents like collisions. This will place their safety in danger.
How we came up with this problem: We have seen many students engrossed in their smartphones during recess time, increasing the chance of knocking into people as they are not aware of their surroundings.

Problem Evaluation Grid

Considerations for Selection	Problems		
	Students spend a lot of time looking at their phones, causing eyesight to deteriorate.	Students tend to get addicted to their phones and will not know when to stop when they need to be doing homework or revising for tests.	Students using their phones will be oblivious to their surroundings, making them more prone to accidents. And it will also affect health.
Feasibility	4	2	1
Scale of Problem	5	5	5
Unavailability of solutions	3	2	4
Total Score	**12**	9	10

2. Define the Problem

Products	**KolourKase**	**Computer glasses**	**"Reminders" App**
Characteristics	**Able to reduce the impact of eyesight deterioration**		
	It reminds the user to stop using the phones, thus lesser time would be spent on their phones.	**It uses lenses to reduce the harmful rays**	**It is based on timings so it does not really show that the user has overused their phones.**
	Able to remove and use it with ease. (Convenient)	**Able to remove and use it with ease. (Convenient)**	**NIL**

	It has other benefits such as it trains the user's self-discipline and control and their self-awareness.	**NIL**	**It only improves efficiency and productivity.**
	Able to do repeated reminders	**NIL**	**Able to do repeated reminders**
	Usually used for smartphones	**NIL**	**Usually used for smartphones**

3. Your BIG IDEA

Write down your proposed invention and why you want to do it. State also how you think your proposed invention is better.

Our proposed invention

We are going to make a phone case that changes colour when the phone is too hot. And certain words will appear. Messages like "Put your phone down" or "Rest your eyes" will be on the case to remind the user to stop using their phones.

It can change colour from red to pink to inform the user that the phone gets too hot. The purpose is to remind users that they have used their phones for too long and enable them to rest their eyes.

The purpose of our proposed invention

The potential benefits:

Health Benefits: This will maintain their eyesight. This will also make them spend more time outside their home to exercise, so they have a healthier body.

Social Benefits: Students will spend more face-to-face time with peers, thus they will be more sociable.

Safety Benefits: Students will be less likely to use their phones while walking or in dangerous places

Our product will be better than existing products as the colour change will remind the students better than other solutions like reminder apps.

This is because colour change is more obvious than a simple notification appearing at the top of the phone. Solutions like locking the phone is not realistic as there is a possibility that the student is in a middle of something important.

Our product is also hardware, which students will notice sooner.

Our product may face problems like refraining students from using the phone is still up to his self-discipline as a student can choose to ignore the colour change. We also need two versions of phone cases - one for Android and one for IOS phones, but the time we have is insufficient to make both.

Our phone case is also not suitable for leather covers.

Project milestones and timeline:

1. Coming up with the idea
2. Selection of mentor
3. Meeting up for the first time
4. Interviewing people for needs analysis
5. Sourcing for suitable materials and constructing the product

4. Construction or Modelling Process

Materials needed: Thermochromic Powder, Clear Glue, a Clear phone case and a Clear container

1. Phone case will be the skeleton for our product.
2. Leuco dye and clear glue will be mixed together to form a paint like mixture.

3. Use a paint brush to apply the leuco dye evenly on the phone case.
4. Leuco dye can change colour when it is heated and will go back to normal when it is cooled down. It is the main material.

The phone case has to **be sturdy and durable** and should not fall apart easily. We have to choose a phone case made of a strong material. It also has to be transparent so that when the leuco dye is coated on the back side of the phone case, the colour change is visible. **Therefore, we have to use a clear phone case.**

The paint has to be brush on evenly so that the phone case can heat up and change colour evenly. **We need to brush on the thermochromic paint evenly and in one direction. It also has to be painted at the back of phone case so that temperature of fingers would not cause the colours to change in direct contact, and that the phone direct contact would cause the temperature to change.**

Clear glue can stick onto a surface. Thus, glue is essential in making the thermochromic paint as it is firstly, colourless. Secondly, it enables the paint to stick onto the phone case so the paint does not come off easily. **Therefore, we have to use clear glue.**

Leuco dye (thermochromic powder) is the cheapest substance to use to make something that is heat sensitive and changes colour. It is also easy to buy as it can be bought online. **Therefore, we have to use leuco dye.**

1) Think of how the prototype looks like and make a draft
2) Make a list of materials needed and think of cheaper substitutes if the material is too expensive
3) Buy the necessary materials

A picture of the materials we will be using for constructing our prototype

4) Experiment on the separate materials and check if it works
5) Put together the materials to make our prototype

A 3d sketchup of our desired design for our prototype

Pictures of prototypes we made using different materials to test out before making the final one

5. Modification and Evaluation

Test Iteration:	Tick			Remarks
Test Date:3/6/2018	Pass	Fail	Potential Failure	
Durability	✓			The dye is not easily rubbed off from the phone case and does not effect the durability of the phone case.

Effectiveness			✓	The colour change will be obvious to ensure that the user will notice and stop using their phone.
Cost	✓			As a colour changing phone case involves a colour changing process and thus will need another specialized material, as long as it is not more than 30 dollars it should be okay.
Test Date:11/6/2018	Pass	Fail	Potentia l Failure	
Durability	✓			
Effectiveness		✓		
Cost	✓			As a colour changing phone case involves a colour changing process, we need another specialized material, the budget is not more than $30.
Test Date:11/6/2018	Pass	Fail	Potentia l Failure	
Durability			✓	
Effectiveness	✓			
Cost	✓			As a colour changing phone case involves a colour changing process and thus will need another specialized material, as long as it is not more than $30 it should be okay.
Test Date:1/7/2018	Pass	Fail	Potentia l Failure	
Durability	✓			
Effectiveness			✓	depending on phone heating up rates, results will differ a lot
Cost	✓			As a colour changing phone case involves a colour changing process, we need another specialized material, budget - not more than $30.

6. References

1. Thermochromic Dyes. (2013, May 29). Retrieved from http://scienceprojectideasforkids.com/thermochromic-dyes/

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