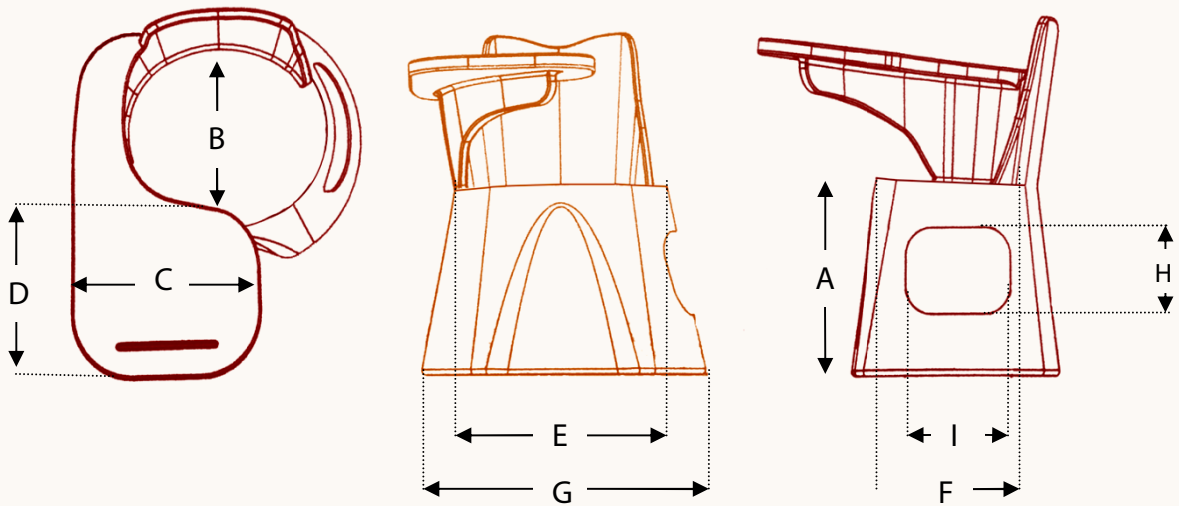


Qdesk[®]

Qdesk's[®] Ergonomic Fitting



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ABSTRACT

Nowadays, ergonomics is one of the most critical factors when it comes to selecting a school desk. In recent years, the number of cases of adolescents developing musculoskeletal symptoms have been increasing since children are expending prolonged times sitting in static posture. Children's wellbeing is a number one priority not just for parents, but also for teachers, desk designers, and QProducts. In an effort to ensure children's safety and comfort, this study aims to provide a desk fitting guideline to match children's dimensions with an appropriate Qdesk model.

INTRODUCTION

QProducts is a multinational organization headquartered at Clearwater, Florida. QProducts has been well recognized within the rotomolding industry because of their new unique eco-friendly rotomolding products. Its most recent creation is an innovative school desk design branded Qdesk. It has been manufactured and marketed in a variety of colors and in three different sizes to accommodate children of different ages and sizes.

Qdesk has been successfully launched overseas, and it is now entering the United States market, where ergonomic desk features are becoming fundamental, due to the high number of children developing musculoskeletal and vision disorders at early stages of their childhood.

The intent of this study is to provide QProducts with a desk fitting guideline, as well as to evaluate the ergonomic features of the Qdesk, in an effort to help reduce the risk of children developing body injuries in the future and to increase customer satisfaction.

BOYS

Age (yr)	5%		50%		95%	
	Weight (lb)	Stature (in)	Weight (lb)	Stature (in)	Weight (lb)*	Stature (in)
2	20	32	29	34	34	36,5
3	28	35	31	37	39	41
4	30	37,5	37	40,5	45	43
5	35	40	40	43	51	46
6	37	42	45	45	60	48,5
7	40	44,5	52	47,5	67	51
8	45	46,5	55	50,5	78	54,5
9	50	48,5	63	52,5	89	56,5
10	57	50,5	71	54,5	105	59
11	60	52	80	56,5	115	61
12	65	54	88	58,5	130	63,5
13	72	56	100	61,5	145	66,5
14	80	59	111	64	160	69,5
15	94	61,5	125	67	174	72
16	103	63	132	68,5	185	73
17	111	64	142	69	193	73,5
18	118	64,5	148	69,5	202	74
19	120	65	150	70	208	74
20	121	65	155	70	210	74

(*) 1 libra= 0.4536 Kgr. 1 pulgada=0.0254 Mt.

Table 1. Boys' Growth Chart (U.S. Department of Health and Human Services)

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GIRLS

Age (yr)	5%		50%		95%	
	Weight (lb)	Stature (in)	Weight (lb)	Stature (in)	Weight (lb)	Stature (in)
2	15	31	28	33,5	33	35,5
3	17	34,5	30	37	38	39
4	25	37	35	39,5	45	42,5
5	32	39,5	40	42	52	45,5
6	35	42	45	45	60	49
7	40	44,5	50	48	68	51
8	45	46,5	55	50,5	79	54
9	49	48	62	52,5	90	56,5
10	55	50	71	54,5	109	59
11	62	52	80	57	120	61,5
12	68	54,5	90	58	132	64
13	73	57	98	61,5	149	66,5
14	82	59	109	63	158	67,5
15	89	59,5	112	62	165	68
16	94	60	119	64	170	68,5
17	98	60,5	120	64,5	174	68,5
18	99	60,5	123	64,5	176	68,5
19	100	60,5	125	64,5	180	68,5
20	100	60,5	129	64,5	181	68,5

Table 2. Girls' Growth Chart (U.S. Department of Health and Human Services)

AGE - GRADE RELATIONSHIP:

Age - Grade Chart

Student Age	Level/Grade	Education
17-18 years-old	grade 12 (Senior)	
16-17 years-old	grade 11 (Junior)	High School
15-16 years-old	grade 10 (Sophomore)	
14-15 years-old	grade 9 (Freshmen)	
13-14 years-old	grade 8	
12-13 years-old	grade 7	Middle School
11-12 years-old	grade 6	
10-11 years-old	grade 5	
9-10 years-old	grade 4	
8-9 years-old	grade 3	Elementary School
7-8 years-old	grade 2	
6-7 years-old	grade 1	
5-6 years-old	Kindergarten	Preschool
4-5 years-old	Pre-Kindergarten	

Table 3. Age-Grade Chart (Kids.Net.Au)

Desk's Dimensions:

The tools used to calculate the desk's dimensions were a tape measure and an angle finder. The dimensions of each model were measured as they are described below:

Seat Surface Height:

The seat surface height corresponds to the distance between the highest point of the seat and the floor.

Seat Surface Width:

The seat surface width is the distance from the right side to the left side of the sitting surface.

Seat Surface Depth:

The seat surface depth is the distance from the back of the sitting surface to its front.

Seat Surface Angle:

Correspond to the slope of the sitting surface.

Back Support Length:

The back support length is the distance from lowest to the highest point of the back support of the desk.

Back Support Width:

The back support width is the distance from the right side to the left side of the back support area.

Back Support Angle:

It is the angle at which the back support of the desk slopes.

Desk Surface Height:

The desk surface height corresponds to the distance between the highest point of desk surface and the floor.

Desk Width:

The desk width is the distance from the right side to the left side of the desk surface area.

Desk Depth:

The desk depth is the distance from the back of the desk to its front.

Desk Angle

Is the angle at which the writing surfaces of the desk slopes.

RESULTS

Actual Qdesk's Dimensions:

Table 4 shows the resultant measurements of each of the three Qdesk models

Measured Item	Model 1	Model 2	Model 3
Seat Surface Height (in)	12.2	14.2	16.1
Seat Surface Width (in)	13.2	14.0	17.0
Seat Surface Depth (in)	11.8	13.5	14.0
Seat Surface Angle	3°	3°	3°
Back Support Length (in)	11.0	10.9	13.8
Back Support Width (in)	11.6	12.8	16.2
Back Support Angle	96°	96°	96°
Desk Surface Height (in)	21.5	25.4	27.6
Desk Width (in)	13.0	13.0	15.0
Desk Depth (in)	24.2	24.0	26.1
Desk Angle	6°	6°	6°

Table 4. Qdesk Models' Dimensions

Ergonomic Desk Basic Design Dimensions for Elementary School:

Recent studies concerning ergonomics desk fittings for children emphasize that the fundamental ergonomic measurements to consider when designing school desks are: seat surface height, depth and angle, back support angle, and desk surface height and angle. Those measurements are the ones that have a major impact on children sitting posture. Most studies agree that an ergonomic desk design should follow the range of dimensions provided in Table 5.



Item	Dimensions
Seat Surface Height (in)	10.2- 16.6
Seat Surface Depth (in)	12.4- 15.7
Seat Surface Angle	3-5°
Back Support Angle	>90°
Desk Surface Height (in)	18-28
Desk Angle	< 15°

Table 5. Ergonomic Desk Basic Design Dimensions

Ideal Ergonomic Desk Design Dimensions for Elementary School:

As a conclusion of previous studies on the matter, more detailed ideal design dimensions information is summarized in Table 6.

Item	5%	50%	95%
Seat Surface Height (in)	11	14	16
Adjustable range	11-13	13-15	15-18
Seat Surface Width (in)	15	15	15
Seat Surface Depth (in)	15	15	15
Seat Surface Angle	3-5°	3-5°	3-5°
Back Support Length (in)	12	12	12
Back Support Width (in)	16	16	16
Back Support Angle	100-105°	100-105°	100-105°
Desk Surface Height (in)	23	25	28
Adjustable range	22-24	24-27	27-29
Desk Width (in)	26	26	26
Desk Depth (in)	20	20	20
Desk Angle	0-10°	0-10°	0-10°

Table 6. Ergonomic Design's Dimensions (Rungtai and Kang)

QDESK'S DIMENSION EVALUATIONS:

Seat:

Regarding the seat surface height, Qdesk's dimensions fits accordingly within the range of the basic as well as the ideal ergonomic desk design in the three of their models. Considering the seat depth and width dimensions, Q desk meets the basic ergonomic requirements considering that model 1 users include preschool children. As results show, the seat surface angle fits perfectly with ergonomic expectations for a school desk.

Back Support:

Qdesk's back support has little curve, letting the spine form the S shape curve necessary in right sitting posture. Its length offered the back-support necessary according to each model user. Ideally, the width should be a little bigger, but considering that Qdesk offers three different sizes and the ideal model focus on just one size to fit all elementary school grades, the length is assumed to meet the standards requirements. The back-support angle falls within the basic ergonomic design dimensions.

Desk Surface:

The desk surface height follows the ideal ergonomic standard for each model when users' age and stature are considered. Regarding the width, offering a bigger surface space is considered more ergonomically efficient. As results show, the desk surface depth as well as its angle fit perfectly with ergonomic expectations for a school desk.



FITTING RECOMMENDATIONS

Previous studies concluded that Qdesk models are able to fit users as it is shown in Table 7 (Bohórquez and Linares).

QDesk	STATURE	
	Min (in)	Max (in)
Model 1	43.2	49.2
Model 2	49.2	55.2
Model 3	55.2	61.2

Tabla 7. Qdesk Model by users' stature

The data analyzed in this research corroborates those fitting suggestions.

QDESK'S MODEL RECOMMENDATION ACCORDING TO SCHOOL GRADE:

Considering that the main potential buyers of Qdesk include school principal or representative, a Qdesk fitting recommendation by school grade is provided in Table 8.

QDESK	5%		50%		95%	
	FROM	TO	FROM	TO	FROM	TO
Model 1	2 nd Grade	3 rd Grade	Kindergarten	2 nd Grade	Pre-Kinder	1 st Grade
Model 2	4 th Grade	6 ^o Grade	3 rd Grado	5 th Grade	2 nd Grado	4 th Grade
Model 3	7 th Grade	9 ^o Grade	6 th Grado	7 th Grade	5 th Grado	6 th Grade

Tabla 8. Qdesk Model by school grade



DISCUSSION

The percentages shown in Table 8 refer to the below average, average, and above average person respectively. For ergonomic evaluation purposes all percentiles were taken into account.

I would suggest using a 95 percentile when recommending according to school grade since more users will be able to fit in the Qdesk. However, using this percentile will reduce the range of school grades targeted to use the Qdesk.

A 50 percentile can be used as well. If it is used, I would suggest providing a few of the other desk sizes as well for cases where the user is below or above the average.

At last instance, I would recommend the 5 percentile because it will just fit a small part of the user; therefore, user satisfaction could be risked.

CONCLUSIONS

The results of this study corroborate that QDesk provides the necessary ergonomic support for children. It was demonstrated that the Qdesk measurements fit within the ergonomic range of dimensions recommended for the design of a school desk.

Recommendations for a fitting guidance were given matching children's anthropometric measurements with optimal school desk dimensions minimizing the risk of developing musculoskeletal disorders in the future. Fitting recommendations can be made according to user's stature or grade depending on customer's preference.

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