E-Bike STEM Education: Opportunity Assessment

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REV 19DEC2016

Opportunity Assessment: (Marty Cagan's 10 questions)

1) Exactly what problem will this solve? (value proposition)
2) For whom do we solve that problem? (target market)
3) How big is the opportunity? (market size)
4) How will we measure success? (metrics/revenue strategy/etc)
5) What alternatives are out there now? (competitive landscape)
6) Why are we best suited to pursue this? (differentiator)
7) Why now? (market window)
8) How will we get this product to market? (go to market strategy)
9) What factors are critical to success? (solution requirements)
10) Given the above, what is the recommendation? (go or no-go)

Exactly what problem will this solve? (value proposition)

The e-bike STEM education program will give students an understanding of the usage, implications and technology of electrically assisted bicycles (e-bikes).

OK, so what's an e-bike? As compared with traditional bicycles, e-bikes provide a low cost transportation alternative for people that commute farther, are older, live in hilly areas, have physical limitations, need to carry more/bigger items, or don't want to sweat and/or wear special commuting clothes.

STEM inspiration: This program provides another platform for inspiring and drawing students to STEM, and sets them up for future opportunities in electrified/smart transportation innovations.

Community contribution: Could allow students to directly contribute to the community by helping to addresses transportation needs (purpose-built e-bikes, e-bike sharing)

For whom do we solve that problem (target market)

High-school students that would become inspired by learning about the technology and their future opportunities associated with smart and electrified transportation. This program will be expanded to include students in alternative high schools.

Members of the community with different transportation needs that are met with e-bikes. This extends the reach of Community Cycling Center's vision to provide everyone with the opportunity to choose active and healthy transportation.

How big is the opportunity? (market size)

- Portland/Salem Area:
  - Traditional High Schools
    - At least 15 high schools participating in the Oregon FIRST Robotics program that an e-bike program could potentially integrate with
    - Other schools are participating in or pursuing other programs, such as Jefferson High and Roosevelt High
  - Alternative High Schools
    - There are at least 4 alternative high schools including Rosemary Anderson, Helensview, and MacLaren that an e-bike program could be migrated to
    - Rosemary Anderson/POIC is also an Oregon FIRST Robotics participant
- Regional / National
  - This program could eventually be expanded into other Pacific Northwest schools, or even nationally

How will we measure success? (metrics, revenue strategy, etc)

- Completion of an e-bike STEM curriculum
- Number of high schools deployed
  - 2017 Goal: At least one.
- Number of new partnerships established
  - 2017 Goal: At least one (Oregon FIRST).
- Additional revenue and/or resources attracted into Community Cycling Center
  - 2017 Goals: At least one Encore Career Fellowship
- Number of new sponsors added as a result of e-bike STEM program
  - 2017 Goal: At least one
- Evaluation of pilot program
  - Get feedback to assess program merit, and ability to map it over to the needs of alternative high schools

What alternatives are out there now? (competitive landscape)

- E-bikes in STEM education: There are no known “competitors”
- STEM education (general): It is currently unknown if adoption of an E-bike STEM program would be hampered by competition over mindshare and resources at schools where there are already established STEM programs (e.g., Robotics, Legos, Airway Science for Kids, etc.).

Why are we best suited to pursue this? (differentiator)

- Community Cycling Center has existing relationships with STEM education programs, local cycling businesses, sponsors, and a local e-bike business.
- Community Cycling Center already has staff that lead the design and deployment of bicycle-centric STEM curriculum.
- Community Cycling Center operates in Portland, which has the highest % bicycle commuting of US cities[1]. This uniquely positions it to lead an e-bike STEM program.

(1) – Source: US Census Burea, 2012 American Community Survey

Why now? (market window)

E-bike products have already taken off in other economies (e.g., Western Europe), where density and transportation costs are significantly higher.

With the North American market for e-bike products expected to continue growing at 10-15%, there are increasing opportunities for students and the community to benefit from this growth.

How will we get this product to market? (go to market strategy)

Partner with and initially deploy in 2017 into a high school that has an established and successful STEM program. This strategy will:

1. Reduce entry barriers by working with existing high school STEM program resources.
2. Provide access to STEM program expertise and learning frameworks that will jump-start the eBike program.

eBike STEM program collateral can then be deployed wider into more traditional and alternative high schools

What factors are critical to success? (solution requirements)

- Adequate donations or funding needed for eBike educational props and training materials (motors, batteries, test equipment/tools, connectors/cabling, etc.)
- Partnership with a local STEM education program.
- A pilot platform left behind that others can carry forward and build upon
- The ability to scale and adapt this program out into alternative high schools

Key Assumptions for success

Assumption	Priority	Uncertainty	How will we verify
Adequate mindshare of high-school STEM resources for e-bike program	High	High	Assure e-bike pilot deployment tasks fit around existing STEM calendar. Get resource commits to support plan.
Building on/into FIRST framework is portable to alternative high schools	Med	Med	Engage with FIRST to confirm that any collateral developed for FIRST is free & open.
FIRST resources can be made available to alternative high schools	Med	Med	Determine if CAD licenses obtainable regardless of FRC Ask FIRST if web site access/storage can be used.
Funds for educational props and training materials will be available	High	Med	Ask and negotiate with prospective sponsors for funding as part of M1 strategic plan completion.
Parts, tools, and shops for e-bikes will be available	High	High	Ask prospective schools what tools and shop facilities are available YOY.
Resources and funding will be available to continue the program	High	High	Confirm with SVP that recurring Fellowship resources can be made available. Develop a funding plan and get feedback from sponsors and partners.

Key Deliverables / Timeline

Milestone	Description	Target Date
M1	Rev1 strategic plan published, updated with Community Cycling Center feedback, and sent to Lakemonster FRC for review.	26Aug2016
M2	Rev2 strategic plan published and updated with Lakemonster FRC feedback. Includes schedule for collaboration tasks, and details of how e-bike curriculum integrates into FRC STEM framework.	15Dec2016
M3	Curriculum and lesson plans completed. E-bike equipment and educational props obtained.	01May2017
M4	STEM partner review of curriculum completed/approved	01Jun2017
M5	Pilot program lessons deployed with STEM partner (est. 6 weeks)	15Jul2017
M6	Written pilot evaluation with partner feedback complete	30Jul2017

What is the recommendation? (go or no-go)

Backup Material

Example E-Bike STEM timeline interleave (vs. Lakemonster robotics program)

	JAN				FEB				MAR				APR				MAY				JUN
E-Bike	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	E-Bike program Opening #1
FRC	FRC 6 week build season								FRC district competitions								Champ Comp				Outreach, CAD/SW train

	JUL				AUG				SEP				OCT				NOV				DEC			
E-Bike	X	X	X	X	E-Bike program Opening #2 Stretch goal: Another 4wk program somewhere within this timeslot								X	X	E-Bike program Opening #3			X	X		X	X	X	X
FRC	Outreach, CAD/SW train				Outreach, CAD/SW train				Recruit, outreach, fund drives				Training				Bunny-Bot CAD design				Bunny-Bot build			
																					BunnyBots training comp			X

E-Bike STEM kit cost estimate – each bike (PRELIMINARY)

Item	Description / details	Cost
Donor bike	700c Hybrid bike with rear rack	Donated (via CCC, etc.)
Motor/controller/ Sensor kit	Rear hub motor (9C+ 2707) on Alex DM24 wheel, 20A motor controller (C4820-GR), Cycle Analyst V3 handlebar controller, grip throttle, Thun torque sensing BB, brake regen lever, temp sense cable.	$889
Battery and charger	48v battery and charger	$665
Totals		**$1554**

* Assume max of 4 students per E-Bike kit

* Source for kit parts estimate: www://ebikes.ca

Tools and test equip
Shared amongst all E-Bike kits on site
(PRELIMINARY)

Item	Description / details	Cost
Smart trainer	Smart bike trainer with PC interface, hill simulation, power measurement, data logging (e.g., Computrainer)	$1149
CA logger	Cycle Analyst Logger for CA3 with GPS (data collection)	$150
Computer Battery Analyzer	500W automated battery load tester w/ PC software	$929
Connector tools	Crimp tools for Anderson / Molex cable connectors, tape etc.	$100
Est . Total		**$2328**

* Assumption: Basic hand tools already available