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CAREER TECHNOLOGY LEANING OUTCOMES WITH DEAF AND HARD-OF-HEARING HIGH SCHOOL STUDENTS FROM A SINGLE ACTIVITY

Present: JAMES MALLORY

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P.O. Box 1924

Lombard, IL 60148

800-825-5234

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>> FACILITATOR: Hello, everyone.

I'd like to introduce Jim Mallory.

Jim's been teaching here for 25 years.

In applied computer technology.

I couldn't remember the length of his topic today, so here I'm going to just read it -- what I'm seeing. "Using

Robolab software and Lego hardware to teach computing to Deaf and hard-of-hearing high school students.

>> JAMES MALLORY: Thanks.

>> FACILITATOR: Thanks, Jim.

>> JAMES MALLORY: Okay.

We'll see how this works.

I've been here 21 years, not 25.

I started here when I was 15.

(Laughter).

>> JAMES MALLORY: Not really.

I want to go through, we went -- we're going to go through some activities that we did with some Deaf high school students every summer, and we started measuring and collecting results, and some of the results we predicted and some of them really surprised us.

Especially related to gender.

You know, male/female differences.

And that's what I'm going to share with you today.

My -- my presentation's pretty short, so there will be a lot of time left at the end for, you know, questions and discussion.

I know it's been a long day and your heads are probably full, so I'll try to keep it moving along for you.

Okay.

First, EYF, okay, explore your future, it's a program designed for high school students who are not sure

about what they want to do in the future, their careers, so this is designed -- it's designed for helping them decide, you know, which area they want to pursue in college.

So they use something called the Holland -- the Holland model, and that looks like -- oops -- looks like this.

Okay.

Oh, I have handouts, also.

They're in the back on my black -- we'll pass out some papers so I have the PowerPoint.

On-line you can view it or I will have a paper handout.

They're in the back there.

Yeah.

So there's really six different categories with the Holland model, and that identifies different areas of interest and strength.

The students, if they want to pursue a career.

Okay.

The category I'm responsible for is called the investigative -- the investigative category, and that's in the upper corner up there.

Okay.

An investigative category, this shows what kind of person would want an investigative kind of category.

You know, it's kind of like the engineers, they're the thinkers, they enjoy, you know, analyzing things.

Very creative.

But really kind of detailed people.

So like our topic was, you know, programming the computer.

So students, if they thought they liked that kind of topic in the future would be -- they would sample our activity.

Okay.

Our results.

With two years, we collected data for two years.

Our total was 394 students in the two-year time.

About half were male and about half were female.

You see the actual numbers there.

So we had a good -- you know, a large, you know, sample size to figure out our results.

Just to explain the activity a little bit, okay, all the Holland categories had -- it was kind of like a company, that we owned a company called EYF toys, and they would have the artists, you know, design the art things and the engineers would do something else.

But we did, you know, programming for the toy cars for this activity.

Just real quick -- okay -- this was the brain.

It's called the RCX.

That's where we -- we actually programmed the computers, the software is stored inside of there.

Then we would connect sensors and different input devices in here.

This is an infrared sensor.

It can see -- like when you design a car, it can follow a line, kind of follow it and see what's happening.

It had output ports, like a motor, so you have input, the car can read a line, and output, the motors would follow the behavior that was programmed inside there.

We did both.

So students -- we only had the students for one hour, so we thought, is it really possible for students to learn the activity, learn the concepts, develop an interest or not in that investigative category?

We thought so, but for two years, we actually measured it and collected the data to prove our results.

Here's one example of a software question.

It's a very user-friendly software, okay?

This is green, okay?

Green light means go, you know.

Start going.

It was running a motor connected to port A that way, and it would run for four seconds and then it would stop.

Okay.

Red light means stop, so it's very user-friendly software just to give students an idea of, you know, how they worked.

Now, this is a more complicated example, one of the last ones.

We had the -- the car would actually follow a line.

You know, if the last -- if it saw black or white, it would turn and at the end of the hour, they were

programming, many of them, that kind of an activity.

So I was really impressed with how fast they learned.

Very motivated.

Okay.

Why the survey?

Because before, we didn't know what they were learning.

Seemed like they were learning having fun but there was nothing really that we could measure, so we wanted some real facts on -- to see if we were successful or not.

And let me jump.

Here's the questions our survey, we asked them.

First we wanted to know, you know, the demographics, of the students.

You know, the age, are they male, female, other things.

And we had some questions related to the career interest and knowledge and some were in the activity itself.

What did they learn.

This is an example of some of the demographic questions here.

Age, you know, communication preferences.

And these students from around the United States, they're from California to Florida to here, so it was a -- it was a wide -- you know, a wide area.

We selected from.

Career questions, we asked them to identify what is an

investigative type of career.

Then we asked them their interest.

Do you want to work in an investigative type of career?

And we asked them before and after, to see if their interest changed.

And that -- the results of that was very interesting.

Here's some sample questions.

You know, samples, what is an input device, what is an output device, just to see, you know, what they knew before and after and compare their learning.

Here's an example of a software question, okay?

There's a program, a computer program.

What's it do?

Well, the proper answer, okay?

Starts the motor, connected at port A, and it ran it at a speed of 5, so that's the problem answer.

So students were forced to kind of take a test at the end.

Now, this is the interesting part, okay?

You see some of our results, okay?

We listed them separately, and the first time, 2001, there was a reduction from 44% decrease to 9%, people that did not know, you know, what the activity was.

In 2002, it's different.

So there was some learning that happened there.

Okay.

Specifically related to computer programming and how it fits the Holland model, pretty good increase in they learned what -- so that helped us -- it showed us that students did learn, you know, what that investigative category and accomplished our, you know, desired results.

Here's what they learned with hardware, related to hardware.

So you see the numbers are pretty good.

I want to do some bar graphs to show you the learning and -- the results.

It seemed to be more clear putting it on a graph.

Here's an example -- okay, the second time we analyzed it.

This starts to become more interesting.

See the hardware?

Okay.

Blue is the male and we'll pass out, you know, papers that show this.

Blue is the male and red was the female, so you can see for learning hardware, computer hardware, okay, both learned a lot during the activity.

And for hardware, it seemed -- seemed like students learned the software more easily.

Why?

You know, our assumption was because they grew up on computers and they're skilled already with other kinds of software and the transfer of knowledge was pretty easy.

So that's hardware results.

Now let's look at software results.

See software?

Kind of similar.

There was a lot of learning.

You see the mean over here?

So -- so big improvement with learning.

Software especially.

So they learned a lot, in about 45 minutes, which kind of surprised us a little bit.

We knew they would learn.

We didn't realize how much.

And here's a table for all the statistic nerds in the audience like me.

(Laughter).

>> JAMES MALLORY: You can compare the results from 2001 and 2002.

The parentheses that are standard deviation, I won't bore you with all the numbers, but you can see that it's pretty similar, the hardware and the software.

The numbers are pretty consistent for both males and females.

So so far, with learning, very similar.

Not a big difference.

Now, career preferences.

This starts with they start being different.

Okay.

Preferences of career, you see the males had more interest in that kind of career before, and the interest actually improved with the activity.

You see that the blue jumped.

Okay.

Look at the red, okay?

The female interest in investigative career basically flat.

There was no change.

So we try to develop a fun activity, get motivated and encourage them, and didn't seem like it helped the women.

So we thought, well, let's make sure we have female kind of role models and separate them into groups, have the males and the females here, make sure we have good, you know, motivated female teachers, and see if that helps improve the results.

(Laughter).

>> JAMES MALLORY: And very similar.

Actually, when they were separated, the interest on the females actually decreased a little bit.

Okay.

We were shocked.

We thought there would be an improvement, and there was many very interesting discussions why that happened, but, you know, consistently the male interest increased and the female stayed about -- statistically,

that's not really significant, so it's about flat.

No change.

So that was kind of a surprise to us.

We thought -- and if you look at like how many females are in like engineering and other areas, it seemed like that just the interest was not there, no matter what you do.

So our general conclusions, the learning was similar from both, you know, mail -- male and female.

Both before and after the activity, female interest was lower than the males.

Okay.

This is after the first activity, we thought, okay, maybe we can increase the interest of females by having, you know, female teachers and kind of grouping them separately because, you know, 17 and 18-year-olds, they have other agendas on their minds, so we thought maybe if we separate them, they'd be more focused.

Actually, it would be kind of competitive between the males, who was going to finish the car first and then -- so it became kind of a competition between them.

We don't know if that helped or hurt, but the results say that it didn't really help.

After both activities, now we're kind of confident of the results, no matter what you do, the male interest will be higher with this kind of an activity.

And again, separating males and females is not going to help the interest.

Maybe there's other ways, but we were really surprised, and with a sample size of almost -- you know, close to 400, it's pretty strong statistical data that ...

So again, hardware, software can be learned in one hour.

Those concepts.

The learning will be the same, male/female will both learn similarly that environment.

And the learning will be similar, it doesn't matter male or female, it will be the same, for the learning.

So I'll now kind of open up to questions and answers.

I don't know how many of you have had experience -- how many of you teach high school?

Deaf or hard-of-hearing?

You do?

I okay.

And you.

>> SPEAKERD4: I'm working on one.

>> JAMES MALLORY: You're working on it now?

>> FACILITATOR: Yeah.

I'm going to be a high school English teacher.

I'm a student right now.

>> JAMES MALLORY: Okay.

Great.

So any of these results surprising to you in the audience with your experience?

Do you want to interpret the audience, please, for me?

Thanks D that surprise you, any of the results here?

>> AUDIENCE: Looking at it from like a -- like a computer tech, because I do like computer projects for like high school kids, and I mean for me, it seems that most -- like the girls and the boys are -- they're pretty much the same interested in like the computer programs that we're using.

So that's surprising.

>> JAMES MALLORY: Yeah.

>> AUDIENCE: But I still think it's -- the girls are more programmed not to do that kind of thing.

I mean, my daughter did that, and I mean and she came here, but she was one of very few girls in the program.

They just -- that's not an expectation that they will do that kind of work.

And I think maybe if we expose them more, maybe more will do that.

I mean my daughter just had the opportunity of doing more of that in high school than most of the girls did, just because she was interested in it.

She kind of forced her way into the program.

It was like a pre-engineering -- a pre-engineering program.

But that wasn't a norm for most girls.

I guess my question is: When these kids were coming to you, was there any of the pre-questions on what was their interest in the future?

>> JAMES MALLORY: No.

>> AUDIENCE: Because I just don't think a lot of girls

see that as an option.

I mean they're still to be a nurse and a teacher and --

>> JAMES MALLORY: Okay.

That's a good question.

Let me clarify.

All of the students were kind of put together, so of the 200 students, we got to see all of them, every one participated in -- you saw the six points of the Holland model, the model that I showed you there?

Okay.

You have to try each one of those.

So maybe you're interested in art and you know that, but you're still forced to go to the engineer -- you know, investigative and this and this, even though you know you know you want art, we're going to force you to participate in all the different activities.

So, you know, some of them are like, you know -- not really into it, which is fine because they knew they were going to be an artist.

Why are you forcing me to take investigative?

I know I don't want that.

Which, you know, you expect some of that.

And -- but the ones that were kind of borderline, you were hoping you could, you know, motivate them with some interest here.

So some of them, you know, first time away from home and, you know, there's other factors there, but you're right.

I mean the statistics show the interest is just not in that

kind of a thing.

I mean, your daughter -- your daughter -- your daughter, she was pretty much among only a few other females in her program?

So that kind of matches those results.

Okay.

>> AUDIENCE: And it was, you know, harder times.

Even in high school, because like they had like a pre-engineering program at the high school.

She was one of the few girls in the program because most of the others weren't interested in it.

So even if they -- I think they can do it, and I think if they're maybe introduced more in the high school level, that they would find the interest.

>> JAMES MALLORY: Maybe, yeah.

>> AUDIENCE: And even today, she's the odd person in her field.

>> JAMES MALLORY: Interesting.

Other feedback.

Yes.

>> AUDIENCE: Well, I mean we just recently started a computer repair class, like -- and it's hardware repair, and this -- or last year, we had a class that was mostly girls and I think that would match your results, you know, because I just -- the interest in that area was, you know -- I mean, they accepted the class and they -- you know, they signed up for the class, but, you know, the interest as, you know, through the -- through the year, it kind of went, you know, downhill.

>> JAMES MALLORY: They weren't really motivated,

they were doing it because they had to, not because they were really motivated and really wanted to?

>> AUDIENCE: Right, right.

>> JAMES MALLORY: Okay.

What about your experiences with high school?

No.

Okay.

Other questions?

Or feedback?

Okay.

Great.

Yeah.

>> AUDIENCE: So what -- what do you do like with these results and what -- like now that you have this information, does this like help develop a curriculum for someone or --

>> JAMES MALLORY: Well, we -- we feel good about the learning that occurred, but with the interest, like she said, we really have to start probably earlier, before to get that interest.

Another thought was, well, the activity itself, like a car is kind of a -- kind of a guy thing, you know, working on cars.

So maybe if we develop -- you know, Ron, my partner in this, he's a statistician, so we had many in-depth discussions, "Well, you know, suppose we design an activity that didn't involve cars, more things that would be interesting for the females," and he -- okay, his opinion was he didn't think it would, you know, change the bottom-line results that they're still not going to,

you know, attract the women into that field as much.

Right now.

Based on that.

So it was more to kind of satisfy our curiosity as to what was really happening.

You think you know what's happening, but until you do the work to collect some data, you don't know.

>> AUDIENCE: Because I'd be interested in seeing like -- because I mean that's a -- that's a very like hands-on mechanical sort of study, which is good, and I'd be interested in seeing like what the -- like the same -- the same way that you did that, but like -- maybe like a computer designing, you know, like --

>> JAMES MALLORY: Oh, sure.

>> AUDIENCE: -- on the computer designing something.

You know, over in the same area of skills but like just a different area because I -- we've had success with that -- when I say "success," with the girls in that area.

>> JAMES MALLORY: Sure.

I would like to gather data from the other activities there, but it's kind of individual.

You can't force people.

It would be interesting to compare the results from, this, this, you know, activity and see maybe these two, you know, a stronger female interest than the other four, so it would be interesting to collect that kind of data as well.

>> AUDIENCE: Yeah.

>> JAMES MALLORY: So other feedback or questions.

>> AUDIENCE: Like even here at the college, at NTID or RIT, what is the percentage of girls that are in those types of programs here at the school?

>> JAMES MALLORY: Engineering is still kind of low.

Computers, it's improved.

I mean, like I teach in applied computer technology, ACT, and there's more women -- it's increasing, but still mostly male.

>> AUDIENCE: Mostly male, yeah.

>> JAMES MALLORY: And it was interesting the difference between hardware and software, okay?

The software was much higher, you know, interest than the hard -- it's kind of what you said.

>> AUDIENCE: Yeah.

>> JAMES MALLORY: So the interest even within that sub--subset there, it's very interesting, you know, the differences.

Other feedback or questions?

Okay.

I think we're finished.

Who is -- Bobby, I think we're finished, and I'll hang out here afterwards.

Anybody that wants to chat, I'd be happy to chat with you.

Okay.

Thanks.

>> FACILITATOR: Thank you, Jim.

Thank you.

I wouldn't mind playing with some of those Lego robots myself.

>> AUDIENCE: I know.

>> FACILITATOR: If you would please take a moment to fill out the evaluation form before you leave, and you may leave it by the door.

And also, don't forget to fill out the green evaluation form talking about the future and how you might be able to actually improve the conference.

Thanks very much.

>> AUDIENCE: The handouts he said.

No, he said he had some.

>> JAMES MALLORY: Oh, handouts.

Coming up, coming up.

Excuse me.

Let me just get these out now.

Here's the handouts.